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HANDBOOK

OF THE

DIAGNOSIS AND TREATMENT

OF

DISEASES

OF THE

THROAT, NOSE, AND NASO-PHARYNX.

BY

CARL SEILER, M.D.,

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SECOND EDITION,

THOROUGHLY REVISED AND GREATLY ENLARGED.

WITH SEVENTY-SEVEN ILLUSTRATIONS.

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PREFACE TO SECOND EDITION.

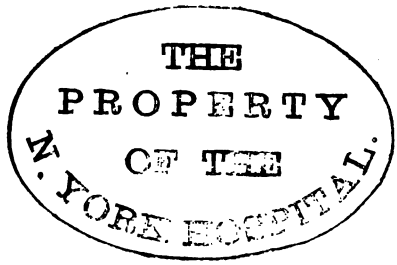
THE favorable reception accorded to the first edition of this work has been exceedingly gratifying, and has encouraged me in the endeavor to make the second edition more worthy of the commendation of the profession.

Voluminous additions will be found in the Chapters on Diseases of the Nasal Cavities as well as in other portions of the book, and I trust they will be found acceptable to those who may have occasion to consult this work. The number of illustrations has been materially increased, and, in many instances, new and original cuts have been substituted for borrowed ones. One of the new features in this edition is a sketch of a Case Record-sheet (duplicates of which may be had on application to the author), which I have found very convenient for keeping a complete record of cases.

I take this opportunity of expressing my gratitude to my friend Dr. John M. Taylor, who made the original drawings for most of the new illustrations.

CARL SEILER, M.D.

1346 SPRUCE STREET,
March, 1883.



PREFACE TO FIRST EDITION.

THIS little volume is intended to serve as a guide to students of laryngoscopy in acquiring the skill requisite to the successful diagnosis and treatment of diseases of the larynx and naso-pharynx. All purely theoretical considerations have therefore been omitted, and only points of practical importance have been discussed as concisely as possible, so that the work may be used as a ready book of reference on the subjects of which it treats.

Several affections, which are classed among systemic diseases, and merely exhibit severe laryngeal symptoms, such as scarlet fever, diphtheria, etc., have been omitted, since they do not strictly belong to maladies of the throat. The tables of symptoms to be found at the end of the volume are based upon carefully kept records of over one thousand cases treated by the author in

private practice, and at the Dispensary of the University Hospital, as well as in the German Throat Infirmary of Philadelphia.

I take this opportunity to express my thanks to Dr. J. Solis Cohen for his aid, and for kindly permitting me to use some of the illustrations which embellish his book on Throat Diseases.

CARL SEILER, M.D.

PHILADELPHIA, May, 1879.

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DISEASES

OF THE

THROAT, NOSE, AND NASO-PHARYNX.

CHAPTER I.

THE LARYNGOSCOPE.

THE laryngoscope is a combination of two mirrors, so arranged as to enable the observer to see the interior of the larynx. The smaller of the two is plane, and is introduced into the back part of the mouth in such a manner as to be directly above the opening of the glottis, while the larger and usually concave mirror serves to reflect a strong light into the mouth and upon the small mirror. The latter in turn reflects the light downward, and thus illuminates the interior of the larynx so that its image can be seen on its surface.

This apparatus, simple as it is, was not invented without much labor, and the experiments of M. Leveret, a French accoucheur, in 1743, the first on record, of Bozzini, Senn, Babington, Sellique, Bennati, Liston, Avery, and others were requisite before Garcia in 1854, and subsequently Türk and Czermak in 1857, were able to use the laryngoscope with advantage for the investigation of the physiology of

the voice, and for the diagnosis and treatment of diseases of the larynx, and give it its present form.[1]

The Laryngeal Mirror.—The laryngeal mirror (Fig. 1) as it is used now consists of a small piece of silvered glass mounted in a metal frame, and attached to a wire stem at an angle of not less than 120°. This stem, about four inches in length and about one-tenth of an inch in thickness, should be soldered to the back of the mirror in such a way that the rim of the frame forms the angle with the stem, and should not be below it, as this would increase the diameter of the instrument, without increasing its reflecting surface. The stem is made to slide into a hollow handle either of wood or of vulcanite rubber, and is clamped at any desired length by a set screw. This arrangement is preferable to a fixed handle, inasmuch as the stem can be pushed entirely into the handle, thus economizing space and render-

FIG. 1.

Laryngeal mirror.

[1] For details of the history of the Laryngoscope, see "The Use of the Laryngoscope in Diseases of the Throat," by Morell Mackenzie.

ing the instrument more portable. The handle should be a little more than three inches long and about one-third of an inch in thickness.

Laryngeal mirrors of different shapes, square, oval, lozenge-shaped, etc., have been used by different observers, but it has been found that the circular form is the most easily borne by the patient, and can be used in the greatest number of cases. However, when hypertrophy of the tonsils exists, an oval mirror can be introduced between the protruding glands more easily than a round one.

Mirrors of polished steel, although they have a better reflecting surface than glass mirrors, are not to be recommended, because they are easily tarnished by the secretions of the mouth and pharynx, and are scratched in wiping them.

Dr. Mackenzie has also used total reflecting prisms mounted on handles like a laryngeal mirror, but has not found them to possess any advantage over glass mirrors.

The round glass mirrors vary in size from half an inch to an inch and a half in diameter, and are numbered by the instrument makers No. 1, 2, 3, 4, and so on. The size No. 3, a little more than three-quarters of an inch in diameter, is most serviceable in the greatest number of cases, but in examining patients it is advisable to have at least three different sizes at hand, say Nos. 1, 3, and 4.

Illumination.—In order to be able to see the laryngeal image in the small plane mirror, the larynx must be illuminated. This may be effected by throwing upon the laryngeal mirror when in position a strong light, which will be reflected down-

ward into the laryngeal cavity. For this purpose either direct or reflected artificial light or sunlight may be used.

Reflected light may be obtained by throwing the light of a lamp, candle, gas-jet, or ordinary daylight into the mouth of the patient, by means of a circular, concave glass reflector.

Reflector.—This concave mirror should be from 3 to 4 inches in diameter, and should have a focus of from 10 to 14 inches; it should be silvered and not backed with amalgam. The metal frame in which it is set is attached, by means of a ball-and-socket joint, to some contrivance by which it can be supported on the observer's head, or be attached to the source of illumination if artificial light be used.

Semeleder recommends for this purpose a spectacle-frame to which the reflector is fastened. By means of the ball-and-socket joint the concave mirror can be brought before either eye, or can be fixed in the middle of the forehead between the eyes. This arrangement, however, will be found not only insecure, but also very tiresome if the reflector has to be supported on the bridge of the nose for any length of time. A much better support for the reflector is the frontal band introduced by Cramer. This consists of a broad strap of some strong material, which passes around the head of the observer, and is fastened at the back by a buckle. To the part of the band resting on the forehead is attached a padded plate, to which the reflector is fastened with its ball-and-socket joint. (Fig. 2.) If a condensing apparatus is used for concentration of light, the reflector is attached to it by a jointed arm.

The reflector usually either has a small hole in the centre, or a small space in the centre is left unsilvered. This opening is intended to be brought before the pupil of one or the other eye of the ob-

Fig 2.

Head-reflector.

server in such manner that the line of vision and that of light have exactly the same direction. Using the reflector in this way like the reflector of the ophthalmoscope, it is easier to obtain an image of the larynx well illuminated, but with the great disadvantage of monocular vision, which makes all objects appear on the same plane, and prevents a correct interpretation of distances—a very important point in laryngoscopy. It will therefore be found more advantageous to place the reflector on the forehead,

and from thence reflect light into the patient's larynx (Fig. 3). Both eyes may thus be employed in viewing the laryngeal image, and a correct idea of the relation of parts in regard to distances may be formed. The line drawn from the pupil of the eye to the laryngeal mirror, and a line from the reflector upon the forehead to the mirror, do not form an angle sufficient to maake any very great difference in the reflection of the light downward, and very little difficulty will be experienced in obtaining the desired image. The head-reflector should be concave when artificial light or ordinary daylight is used, but should be plane when direct sunlight is employed, for the concentration of the sun's rays by a concave reflector produces so much heat as to become painful to the patient.

FIG. 3.

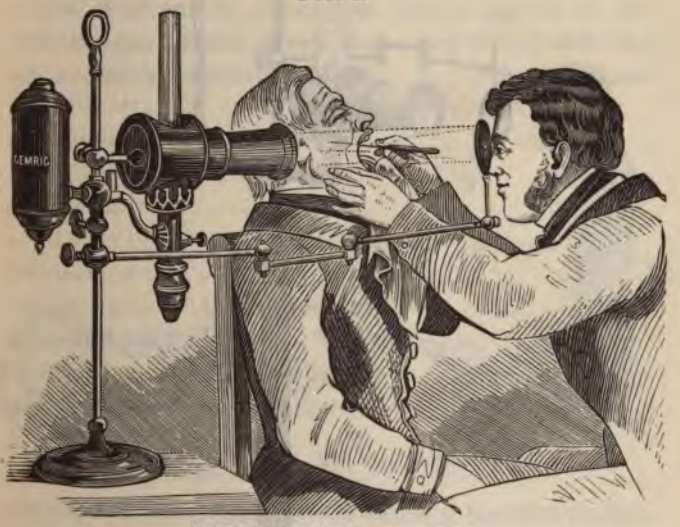
Head-reflector in position.

Source of Light.—As an artificial source of light a candle, coal-oil lamp, or gas flame suffices for ordinary purposes. But frequently it is desirable to have a much stronger light than can be obtained in this manner, and several forms of apparatus for concentrating artificial light have been constructed and are in use.

The simplest of these is the so-called "Schuster Kugel," first recommended by Türk, and used especially for clinical purposes by Stoerk and others. It

consists of a large spherical flask of glass filled with pure water, which is suspended in front of a lamp or gas-jet, and which concentrates the light very powerfully. The concentrated beam of light is then re-

FIG. 4.



Tobold's illuminating apparatus.

flected from the head-reflector into the mouth of the patient.

Tobold, of Berlin, constructed a more elegant light-concentrator for the laryngoscope, which is known as "Tobold's lamp." It consists of a brass tube containing several lenses, which are placed, one before the other, at such distances as to give the greatest possible amount of concentration of light. The back part of the tube is closed, while near the end two large holes are cut in its sides opposite to each other, through which the chimney of a lamp projects. The

whole is fastened, by means of clamps, to a stand, to which is also attached a jointed arm bearing the reflector. (Fig. 4.) This apparatus is especially adapted

FIG. 5.

Cohen's modification of Tobold's lamp.

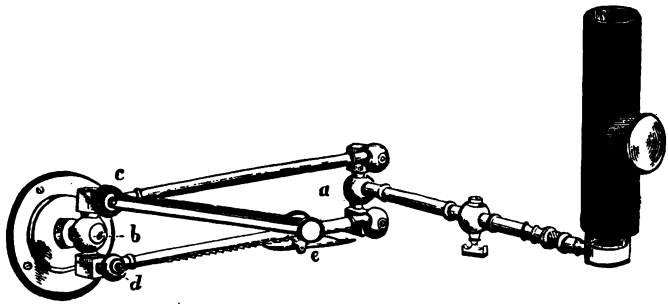
for use in the office, where, unless disturbed, it can remain in the same place when not in use.

Dr. J. Solis Cohen has modified Tobold's ap-

paratus by employing gas, and by inserting the rod which carries the concentrator and reflector in a metal stand, so that the light can be raised and lowered more easily to suit the different heights of patients. (Fig. 5.)

Dr. Mackenzie, of London, makes use of an adjustable gas fixture, which is secured to the wall like an ordinary bracket-light (Fig. 6). For a number

FIG. 6.



Mackenzie's bracket-light, with concentrator.

of years I have used in my office a bracket similar to Mackenzie's, upon which the Tobold apparatus is mounted. It has the advantage of being easily moved with one hand into the proper position, and at the same time its joints are stiff enough to support the weight of the light-concentrator and hold the bracket in any position without the use of a ratchet such as is used in Mackenzie's bracket, and which necessitates the use of both hands in changing its position. Mackenzie's light-concentrator—less complicated, more portable, and yet quite as efficient as Tobold's—consists of a cylinder of sheet iron, about 6 inches long by 2½ in diameter. Near one

end a hole is cut in the side of this cylinder, and a short piece of tube holding a condensing lens is attached to the edge of the hole. This lens, which is plano-convex, with a spherical curve, and of 2½ inches diameter, is placed with the plane side towards the light. The height of the cylinder is to be so adjusted as to bring the centre of the lens opposite the centre of the flame. (See Fig. 6.)

This concentrator is intended to be slipped over the chimney of an Argand burner, but it can also be used in connection with a candle, lamp, or ordinary gas flame, to which it can be fastened by spring clamps attached to the lower end of the cylinder. The concentrated light thus obtained is then reflected from the head-mirror, and can thus be thrown in any desired direction. The so-called lime-light, with its powerful and white illumination, can with advantage be used for laryngoscopy, and a number of laryngologists so employ it, but it requires some skill and experience to keep the light steady, and unless a large number of patients are to be examined in succession it will prove too expensive a luxury. The same holds good of the old electric-arc light, in which the source of electricity was a battery, requiring constant attention, and the lamp with its carbon points was not only very expensive, but also was liable to get out of order. Since the great progress in electric lighting within the last few years, through the improvements in dynamo-electric machines and the invention of the incandescent lamps, however, electricity has become available for many purposes of lighting, and among others for laryngoscopy. The experiments in this direction, which I

have carried on for some time past, were so promising in their results that I feel authorized in embodying them in the second edition of this small volume, with the hope that others may profit by them.

Mounted upon the universal gas bracket is an incandescent lamp, in place of the Argand burner, upon which is placed the Tobold light-concentrator with its reflector. The necessary current is developed by a small dynamo-machine worked by hand or foot power, or by my galvano-cautery battery to be described later on. The light thus developed is considerably greater than the gas-light, and at the same time somewhat whiter. The lamp alone without a concentrator did not give as satisfactory results as with it. A small arc light of the Brush pattern, with slender carbon rods, gives a stronger and whiter light, but is too unsteady for practical use. Perhaps the most satisfactory results I obtained from an incandescent lamp mounted on the head-band in front and a little to one side of the concave reflector, especially in rhinoscopy, as the strong light, devoid of any heat, enabled me to illuminate the post-nasal cavity much better than could be done with the gas or lamp-light with or without a light-concentrator. I have no doubt that in the near future, when electric lighting will have been adopted universally, as gas is now, electric lamps for the laryngoscope will supplant all other sources of light, with the exception of sunlight.

Sunlight is certainly the best source of light for the illumination of the interior of the larynx and nasal cavities, but unfortunately it is not available at

all times and in all localities. When it can be obtained, however, the student should not neglect the opportunity, and should not be deterred from using it for examination by the little extra apparatus and trouble necessary.

The most convenient plan is to place a small plane mirror mounted upon a stand in such a manner that it can be turned in any direction, such as a small toilet glass, in the direct rays of the sun coming through a southern window. Then turn the mirror until the reflection falls upon a second plane mirror supported by a jointed arm and placed in a distant corner of the room, and in front of the chair upon which the patient is seated with his back toward the first mirror. The light from the second mirror is then thrown into the patient's mouth in the same manner as when a light-concentrator is used. In fact, the concave reflector of a Tobold's apparatus may be removed and a plane mirror substituted for it. The second mirror may also be mounted on the head-band and used as a head-reflector, but this latter plan is not as satisfactory, because the reflected light from the first mirror is apt to strike the observer's eye and temporarily blind him.

Sunlight, as well as the light of the oxy-hydrogen and electric-arc lamps, is white, and therefore shows us the parts in their natural coloring, which is claimed as a very great advantage over all other sources of light.

It is true that the yellow rays, which are predominant in all other artificial lights, make the mucous membrane appear redder than it really is, and the

observer may be led to believe that a congestion exists if the patient be examined by white light first and then by yellow light on different occasions. But as all our knowledge and appreciation of shades of color depend upon comparison with a standard, it makes no difference whether this standard, as in the case before us, be a little redder when viewed by yellow light or not so red when viewed by white light. This advantage of the white light is, therefore, not of much practical value, and the expense and difficulties connected with the use of oxy-hydrogen or electric-arc light for laryngoscopy fully outweigh any advantage which can be claimed for it.

Direct illumination may be used for laryngoscopy by throwing the light of a concentrator, or even of an ordinary lamp, into the patient's mouth, and reflecting it downward by means of the laryngeal mirror. This method of illumination, although practised by some laryngoscopists in Europe, is not to be recommended, because the source of light must either be placed between the observer and the patient, which materially interferes with the use of the hands and arms; or the light must be thrown in an oblique direction, when the hand holding the mirror, or the lips and cheek of the patient, throw a shadow upon the mirror, either obscuring it entirely in many positions, or allowing but a part of its surface to be illuminated.

Czermak suggested another mode of illumination of the larynx, which he called "*illumination by transparency.*" It consists in concentrating strong sunlight upon the outside of the neck, thus filtering the light, so to speak, through the tissues until it reaches

the interior of the larynx; but even under favorable circumstances, as when the neck of the patient is thin and emaciated, only a very dimly lighted image of the larynx can be obtained by this means.

CHAPTER II.

THE ART OF LARYNGOSCOPY.

BEFORE entering upon a description of the details of laryngoscopic examinations it will be necessary to understand the optical principle involved in the process. This principle is the law *that the angle of reflection is equal to the angle of incidence.* Applying this law to our case we find that, in order to illuminate the interior of the larynx, we must place a reflecting surface above and behind the opening of the larynx at such an angle that the light received on this surface shall be reflected downward. (Fig. 7.) The rays forming the laryngeal image will then return in the usual way; that is, will be reflected from the same mirror to the eye of the observer. From this it will be seen that the nearer the head-reflector is placed to the eye of the observer the better and the more easily will the image be seen.

It should always be borne in mind that the image seen in the mirror is a reflected one, like the image of one's self seen in a looking-glass. On account of the difference in height of the different parts forming the image, and because the mirror must be placed above and behind the opening of the larynx,

it appears reversed in an antero-posterior direction. Parts that are in front appear in the image to be behind, and *vice versâ*. The same holds good when looking at a drawing of a laryngoscopic image.

FIG. 7.

Diagram of section of head, showing the position of laryngeal mirror in the pharynx.

Position of Patient and Observer.—The relative positions of the observer, the patient, and the source of light are of very great importance, especially for the beginner. The observer and patient should sit opposite each other, so that the eye of the former is

about a foot from, and on a level with, the mouth of the latter, whose head should be slightly raised and inclined backward. In order to be in a comfortable position when near enough to the patient's mouth, the observer should either bring his knees to the left of the patient's, or else place one knee on either side. The latter plan is in many cases preferable, especially with children, because the practitioner can, to a certain extent, control the motions of his struggling patient by holding him with his knees. For office work it is most convenient to use piano-stools, which can be raised or lowered, for the seats both of the patient and the examiner, so that the difference in the height of different patients can be compensated for. The lamp or source of light should be placed to the left of and a little behind the patient, the centre of the flame being on a level with the patient's eye. (See Fig. 4.) When the laryngoscope is frequently used at the office of the practitioner, it is of great advantage to have a head-rest, such as photographers use, attached to the chair occupied by the patient, so as to prevent any change of position of his head (Fig. 8).

FIG. 8.

Chair with head-rest.

The positions having been taken, the observer, by means of the reflector, then throws the light upon the patient's mouth, so that the circle of light is

bounded above by the tip of the nose and below by the chin. If a reflector is used which is attached to a light-concentrator, by means of a jointed arm, no difficulty will be experienced in throwing the light in the desired direction. If, on the other hand, the head-reflector is employed, it is advisable to obtain an *easy position for the head and then to move the reflector on its universal joint until the circle of light falls upon the patient's mouth*, when the joint may be tightened, thus securing the reflector in the proper position. After this has been accomplished, the observer cannot turn his head without moving the light from the proper direction, but having first secured an easy and comfortable position for his head, he can readily assume it again, after having moved, and throw the light in the proper direction. If, on the other hand, the position of his head was a constrained one, it will be difficult, if not impossible, to again reflect the light into the patient's mouth. I should, therefore, advise all beginners to practise with the head-mirror until they are able to quickly reflect the light in any desired direction, as, for instance, upon a spot on the wall, before attempting to examine a patient. They will thus save much annoyance to themselves, as well as to their patients, and will much more readily overcome the difficulties experienced by all beginners in laryngoscopy. When the reflector has been properly adjusted, the patient is required to open his mouth as wide as possible, still inclining the head backwards, so that the centre of the disk of light falls upon the base of the uvula, thus illuminating all surrounding parts.

Before introducing the laryngeal mirror, a careful

inspection should be made of the parts displayed, and, if the tongue should obstruct the view by rising at its roots, the patient should be required to pronounce the vowel sound of "Eh," which causes a rise of the velum palati and allows a view of the pharynx. In some cases it becomes necessary to depress the tongue by means of an instrument called the tongue-depressor, which will be described further on.

Introduction of Laryngeal Mirror.—The pillars, tonsils, uvula, and pharyngeal walls having been examined, the laryngeal mirror, after having been warmed to prevent the condensation of moisture on its reflecting surface, is introduced in the following manner:

The handle is held between the thumb and forefinger of the right hand like a penholder, with the reflecting surface of the mirror looking downward. The hand is slightly flexed backward upon the wrist and is held a little below the mouth of the patient (Fig. 9). By a forward motion of the hand and a slight raising of the arm, the mirror is quickly carried into the mouth of the patient, until its back touches and raises the uvula. (See Fig. 7.) Meanwhile, the left hand of the observer has grasped the protruded tongue of the patient, and holds it by means of a soft towel or napkin to prevent its slipping through the fingers. This holding of the tongue is necessary in order to increase the space in the pharynx, and also to raise the larynx and bring its opening nearer to the mirror. Care should be taken not to pull too hard, as the frænum of the tongue coming in contact with the edge of the lower

teeth is easily injured. In cases where it is necessary to make applications to the throat, the operator needs both his hands, and the patient should therefore be taught to make traction upon his tongue himself.

In the act of introducing the mirror great care should be taken not to touch the tongue or palate,

FIG. 9.

Position of hand in holding the laryngeal mirror.

as this not only injures the reflecting surface of the mirror for the time, but also produces gagging, especially in persons not accustomed to laryngoscopic examinations. Greater immunity from this inconvenience is obtained by carrying the instrument quickly and steadily back until the desired point is reached.

The handle of the mirror is then brought to one side until it lies in the angle of the mouth; this movement brings the hand out of the line of vision. In this position it is advisable to steady the hand by resting one or two fingers against the cheek of the

patient. If the mirror, lifting the uvula and resting with its lower rim against the posterior wall of the

FIG. 10.

Laryngeal mirror in position, displaying the laryngeal image. (Cohen.)

pharynx, is allowed to tremble, gagging or retching immediately results, and prevents any further examination at that time.

When in position the mirror is slowly but steadily turned until the image of the larynx appears on its surface and can be examined (Fig. 10). The patient is required to say "Eh," in order to cause a rising of the epiglottis and to enable us to see the vocal cords in motion. As soon, however, as there is any indication of gagging, the mirror should quickly be withdrawn, for if this is not done retching will follow, and not only cause a slight hyperæmia of the mucous membrane, but also make the throat so sensitive that a further examination becomes impossible. It is always better to introduce the mirror frequently and leave it in position but a short time than to wait until gagging sets in. The throat, however, soon becomes very tolerant to the presence of the mirror when it is held still, and then the examination of the larynx can be prolonged for a considerable time, and is often terminated only by the mirror becoming cool and moisture condensing on its surface. In order to obviate this difficulty, Dr. Henry Wright recommended, and actually employed, a very ingenious plan for keeping the mirror at a uniform temperature. He attached to the back of the mirror an insulated spiral of thin platinum wire, which was connected with a small battery by means of thin copper wires running along the handle of the mirror. When the current is established, the electricity becomes concentrated in the spiral, and elevates its temperature and also that of the laryngeal mirror. It has recently been recommended to coat the mirror with glycerine, which would absorb the moisture; but this procedure materially interferes with the definition of the image, and has to be renewed every

time the mirror is introduced. For all purposes it is best to slightly warm the mirror over the lamp, with the *glass* next to the flame so as not to injure the silver or amalgam backing by over-heating. Before introduction, the mirror should be placed against the back of the hand of the observer, in order to test its temperature, and prevent its being placed in position while too hot. Many laryngologists are in the habit of testing the temperature of the mirror by placing it against the cheek. This is, however, a dangerous practice, for a slight abrasion of the skin of the cheek escapes notice, and may be inoculated with syphilitic poison from a primary sore or mucous patch in the pharynx which has been touched with the mirror, while a scratch on the hand is seldom, if ever, overlooked, and thus the danger of inoculation may be avoided.

Obstacles to Laryngoscopy.—The difficulties attending laryngoscopy, and the obstacles which prevent a good view of the larynx, must be considered under two heads: 1st. Those that are produced by the examiner himself, which have already been alluded to. They consist principally in an irritation of the fauces due to the trembling of the mirror when in position, the touching of the back of the tongue or palate while introducing the mirror, pulling the tongue out too forcibly so as to give rise to pain, and, finally, the want of proper adjustment of the light, without which the larynx cannot be illuminated, even though the laryngeal mirror is in the proper position.

2d. Obstacles presented by the patient. They are dependent upon undue irritability or peculiar formation of certain parts of the throat.

Undue irritability of the fauces is of rare occurrence and is usually confined to the posterior wall of the pharynx. In most cases want of steadiness of the mirror is the exciting cause. It may be overcome by holding the mirror so that its lower rim does not touch the pharynx; by letting the patient drink a glass of ice-water immediately before the mirror is introduced, the cold producing local anæsthesia for a short time; or by employing some anæsthetic, such as ether or chloroform, thrown into the fauces by means of an atomizer. Painting the fauces with a strong solution of potassium bromide has been recommended, but I have not found it as reliable as I was led to believe. The surest means of overcoming this irritability is practice on the part of the patient, thus causing the parts to become accustomed to the presence of a foreign body. This consists in frequent introductions of the mirror, even without the anticipation of seeing anything on the part of the observer, or by directing the patient to introduce a teaspoon as far back into his throat as possible. If the patient is willing to do this before a looking-glass three or four times a day, he will in a very short time be able to bear the mirror for a considerable time when held firmly without trembling. The greatest difficulty, however, experienced by the beginner, is caused by a rising of the back of the tongue at the approach of the mirror, in spite of the traction made at its tip. In such cases, which are rather frequent, the tongue should be depressed with the tongue-depressor, not *forcibly*, but by slight long-continued pressure, which tires the muscles of the

tongue and causes the organ to subside to a level with the lower teeth. If force be used, the tongue will slip from under the blade of the instrument and rise higher than before. This may recur repeatedly, until both the patient and the hand of the observer are tired out by futile efforts.

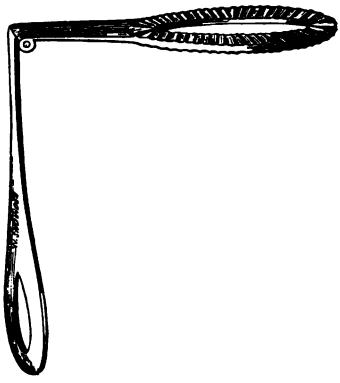
The *tongue-depressor*, in the simplest form in which it is daily used by the general practitioner for examining the fauces is the handle of a spoon. For laryngoscopic purposes the spoon is, however, not to be recommended, because the hand holding it must be on a level with the mouth, thus obstructing the view and light. An instrument has therefore been constructed which obviates this difficulty. It consists of a leaf-shaped blade of silver or German silver, bent at right angles and inserted into a flat wooden handle. The lower surface of the blade is slightly concave, and ribbed so as to to take a better hold of the slippery back of the tongue, and from the bend is about three inches in length. It is introduced into the mouth as far back as possible, and pressed upon the back of the tongue, while the hand of the examiner is below the chin of the patient. For the sake of convenience in carrying the instrument, the blade has been so hinged to the handle that it will fold up against the latter, and will open at a right angle with it (Fig. 11). A more elegant and lighter instrument of the same description has lately been introduced in which the handle is also made of metal, and, like the blade, is heavily nickel plated, and which, when folded, can be carried in a pocket-case (Fig. 12). Soon, however, the metal tongue-depressor becomes tarnished by the

secretions of the mouth or by the substances used for applications to the throat, and then presents an appearance disgusting to many patients, who will

Fig. 11.

Tongue-depressor.

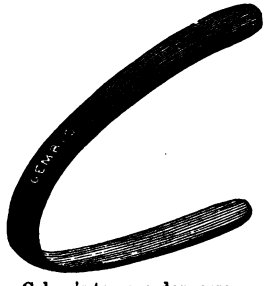
Fig. 12.



Folding tongue-depressor.

not, on that account, submit to its use. For the sake of greater cleanliness, Dr. J. Solis Cohen de-

Fig. 13.



Cohen's tongue-depressor.

vised a tongue-depressor made of hard rubber; this is known as Cohen's tongue-depressor (Fig. 13). It

consists of a piece of ebonite bent upon itself, either end being a little over three inches long. The bend being more than at right angles, the hand holding the instrument rests underneath the chin of the patient; but, if a different curve be desired for any particular case, it can easily be obtained by placing the instrument for a little while in hot water. When soft it can be bent into any shape, which it will retain when cooled by immersion in cold water.

Enlarged tonsils sometimes prevent the introduction of a round mirror into the fauces, while an oval one may be slipped between the projecting glands.

The most serious obstacle is a too large or a pendent epiglottis, which completely shuts out the view of the interior of the larynx. By letting the patient sing in a very high key, or making him laugh, we can frequently get a glimpse of his glottis. There are cases, however, fortunately not very common, where this is of no avail. Several observers have devised instruments for the purpose of holding the epiglottis forward while the mirror is in position. They are long, slender, slightly bent forceps, the shanks of which are crossed so that the ends are closed, instead of opened, by the spring. The ends are furnished with sharp points, which, when the forceps is applied, penetrate the mucous membrane, and thus prevent slipping (Fig. 14). This is unnecessary, since forceps whose spring is sufficiently strong, and whose ends are well roughened, will hold the epiglottis without slipping. Several German laryngoscopists, in operations at the anterior angle of the glottis, have drawn a silk thread through

the body of the epiglottis and held it up by pulling upon the ends hanging out of the mouth. They assert that no evil consequences have followed this procedure, and that the amount of pain caused by transfixing the epiglottis is scarcely worth mentioning. A better plan, however, is to attach to the epiglottis a so-called bull-nosed forceps, such as is used for the compression of arteries in surgical operations, with a string and small weight tied to it. The weight hanging out of the mouth of the patient makes traction upon the string and forceps, thus elevating the epiglottis. In most cases, at least the arytenoid cartilages can be seen without artificially elevating the epiglottis, and from them a great deal of information as to the movements of the cords and the condition of the mucous membrane can be obtained.

FIG. 14.

Elsberg's sponge-holder and epiglottis forceps.

Auto-laryngoscopy.—The first successful attempts at laryngoscopy were made by Garcia on himself. He observed the action of his own larynx in singing. Since then auto-laryngoscopy has been frequently resorted to in order to obtain the

necessary skill for manipulations necessary in laryngoscopy, for the hand is guided not only by the eye of the observer but also by the sense of touch in his throat, thus enabling him to detect and correct a false motion much more quickly.

The instruments needed for this method of examining the larynx are the same as are used for the examination of the larynx in others, with the addition of a plane mirror, in which the image of the larynx reflected from the laryngeal mirror is seen. A short description of the procedure and of the position of the instruments will enable any one to practise auto-laryngoscopy.

The observer, having seated himself in a chair, with or without a head-rest, places in front of himself a lamp, at such a height that the centre of the flame is on a level with his mouth when the head is slightly raised and inclined backward. Immediately below the flame a small plane mirror, about four inches square, is fastened to the lamp, or, better still, is mounted on a separate stand and placed to the right of and a little above the flame. If a concave reflector is to be used to throw the light into the throat, the lamp is placed a little behind and on the right side of the observer's head, so that the light does not shine directly into his eyes and thus interfere with distinct vision. The reflector, mounted on a stand high enough to be on a level with the mouth and movable in all directions, is placed in front of the observer, and alongside of it the plane mirror. If sunlight can be obtained, the reflector can be dispensed with, and the plane mirror used to throw the light into the fauces, the observer seating

himself with his back to a southern window and allowing the sun to shine on the plane mirror.

When all is ready, the laryngeal mirror having been warmed, the observer opens his mouth, pulls out his tongue with his left hand protected by a towel or napkin, and introduces the mirror quickly into the fauces, observing and guiding his motions by the image reflected from the plane mirror. Upon emitting a sound, and at the same time rotating the mirror in the fauces until the laryngeal image appears on its reflecting surface, he can study the motions of his own larynx during vocalization, or quiet breathing, by the reflection of its image in the plane mirror before him.

The same precautions to prevent gagging have to be observed in auto-laryngoscopy as are necessary in examining a patient, and for this reason the beginner should commence by examining his own larynx, for then he will learn by his own and often painful experience how to overcome the obstacles to laryngoscopy much sooner than he would by practising first on others.

Infra-glottic laryngoscopy.—In some cases where tracheotomy has been performed, and the canula is fenestrated, the larynx can be seen from below by introducing a very small mirror through the tube with its reflecting surface turned upwards. Of course, the image obtained in this way is an entirely different one from the ordinary image of the larynx as seen from above, and hardly anything else than the vocal cords, which on their under side are reddish and not pearl-white as on their upper surface, is noticed.

Only in cases where the larynx cannot be seen from above, on account of cicatrization of the epiglottis tying this organ down, or in cases of tumors extending below the glottis, is this method, which was called by Mackenzie "infra-glottic laryngoscopy," of any diagnostic value.

Rhinoscopy.

Rhinoscopy is the art of inspecting the nasal cavities, and may be divided into anterior rhinoscopy or the examination of the anterior nares through the nostrils, and into posterior rhinoscopy or the inspection of the vault of the pharynx and the posterior nares from behind.

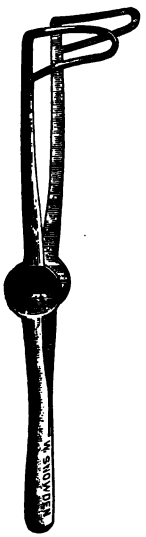
The anterior nares may in many cases be examined in the following manner with a simple bent probe. A strong light being thrown upon the patient's face, and the head inclined backward until the nose is on a level with the examiner's eye, the latter rests the fingers of one hand upon the forehead of the patient, and elevates the tip of the nose with his thumb. With the probe introduced into the nostril he separates the ala from the septum with the other hand, thus opening the nostril sufficiently to illuminate the anterior nasal cavity on that side up to a considerable distance, and to examine the condition of its lining mucous membrane. The opening of the nostril may, however, be effected more thoroughly by means of an instrument called a nasal dilator, of which there is an endless variety in the market, and among them I have found Elsberg's trivalve dilator (Fig. 15) and Bosworth's

self-retaining dilator (Fig 16) to be the most satisfactory. The blades of these instruments are introduced into the nostril and being separated by the fingers holding the dilator, as in the case of Elsberg's, or by the spring, in the case of Bosworth's, dilate the nostril sufficiently to allow the inspection of the anterior nasal cavity, and to make room for the intro-

FIG. 15.

Elsberg's trivalve dilator.

FIG. 16.



Bosworth's nasal dilator.

duction of instruments high up into the nose. This forcible separation of the soft parts from the septum, which is effected by these instruments, is, however, a great disadvantage for diagnostic purposes, because by it the parts are distorted and disturbed in their relation to each other, so that it is impossible to form a correct estimate of the condition of the parts, as

regards proximity to each other when the nostril is not dilated. If for instance an obstruction, caused by hypertrophy or swelling of the tissue at the anterior extremity of the lower turbinated bone, exists, as is so frequently the case in nasal catarrh, this will escape notice, because the obstruction is temporarily removed, through the forcible separation of the parts by the blades of the dilator.

For this reason and for others which will be apparent later on, I prefer a rubber nasal speculum, for examining the anterior nasal cavities, which closely resembles the ear-speculum in common use, except that it is somewhat larger and has an oval opening instead of a round one at the narrow end (Fig. 17). Three sizes, fitting into each other, and

FIG. 17.

Nasal speculum.

forming what is called a nest, are manufactured and are all that is necessary for most cases. They should be made of hard rubber and their inner surface not very highly polished, while the edge of the smaller opening should be rounded off so as to prevent injury to the mucous membrane. The metal specula with a highly polished or white inner surface, which are sold by instrument makers, are not satisfactory because they are more disagreeable to the patient, are apt to become tarnished by the secretions or the

solutions used in treating nasal diseases, and the internal reflection from the inner bright surface by dazzling the eye materially interferes with distinct vision of details in the cavity beyond.

In making an examination the speculum is introduced with a slight rotatory motion into the nostril until its end has passed the margin of the vestibule, the ridge or constriction in the nostril where the skin joins the mucous membrane. A strong light from the stationary or head-reflector is then thrown through the speculum into the cavity, when, by moving the speculum up and down, the different portions of the cavity may readily be examined in succession. The head of the patient also should be moved while inspecting his anterior nasal cavities, so that the light can be thrown up when the head is inclined backward, or down along the floor of the nose when inclined forward. When accumulations of secretion obstruct the view, they should be removed by washing out the cavity with an alkaline solution thrown in with an atomizer, and any changes in the bulk of the different portions should be examined as to their consistency by touching them with a probe bent at an angle to the handle, and introduced through the speculum.

Posterior Rhinoscopy.—The examination of the posterior nares is much more difficult than either laryngoscopy or the inspection of the anterior nares. It is accomplished by the same instruments and appliances used in laryngoscopy, namely, a small plane mirror, and a strong light thrown into the fauces by means of a reflector.

Unlike as in laryngoscopy, the head of the patient

should not be inclined backward, the tongue remain passively on the floor of the mouth, and should be held down with a tongue-depressor, so as

FIG. 18.

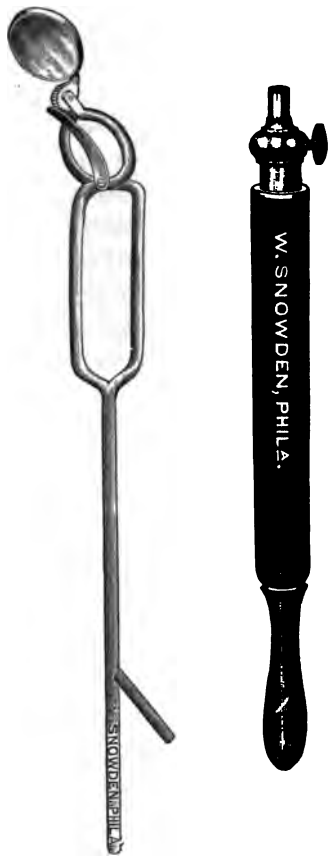
Diagram showing rhinoscopic mirror in position. (Bosworth.)

to increase the space in the fauces as much as possible. The mirror having been warmed, is then introduced into the pharyngeal cavity behind the velum

palati with its reflecting surface turned upward, and by manipulating, it is caused to reflect the light from the reflector upwards and forwards so as to illuminate the vault of the pharynx and the posterior nares (Fig. 18). An experienced manipulator can use a mirror of considerable size, and the larger the better, but a beginner should not attempt to introduce a mirror larger than one-half inch in diameter. The stem of the mirror should be slightly curved, with the convexity of the curve pointing upwards, as this facilitates the introduction of the mirror, and enables the observer to obtain the proper angle for the mirror more easily. In laryngoscopy it is necessary that the mirror should be attached to the stem at a fixed angle (120°), but in posterior rhinoscopy the angle should be different in different cases, because of the individual differences found in the distance from the vault of the pharynx to the base of the tongue, and from the posterior wall of the pharynx to the posterior nares. It is therefore of great advantage to be able to change the angle of the mirror, and thus adapt it to the requirements of the case. This may be done with Jarvis's rhinoscopic mirror and tongue-depressor (Fig. 19) as modified by myself. The instrument consists of a stout wire which, after having been forked or divided at some distance from its insertion into the handle, forms the loop for the tongue-depressor. The two branches then cross each other, and are bent to form another loop at an angle to the larger one. The ends of the wire are somewhat flattened and press against each other, thus closing the smaller loop and forming a sort of pincette, which can be opened by pressing the

sides of the larger loop towards each other. The ends of the pincette are perforated by a small hole

FIG. 19.



Jarvis's rhinoscopic mirror and tongue-depressor.

which receives a pin attached at right angles to the short shaft of a small mirror, thus forming a hinge

so that the mirror can be placed at any desired angle with the handle or stem. The spring of the pincette cannot, however, be made strong enough to prevent a change of the angle of the mirror by coming in contact with the pharyngeal wall, and I therefore had a ratchet placed at the shaft of the mirror where it is hinged to the ends of the pincette, and a small steel spring coming from one of the branches of wire where they cross each other to form the small loop, by engaging in the teeth of the ratchet, holds the mirror at the angle given to it before introducing. The large loop acts as a tongue-depressor, so that with this admirable instrument the examination of the post-nasal cavity can be made with one hand, leaving the other free for the manipulation of other instruments. In order to be able to exert more pressure upon the tongue and to bring the hand out of the line of vision, the handle may be attached to the stem at an angle like the one in the folding tongue-depressor.

Having introduced the mirror into the pharynx behind the velum, it will be found that in most cases the palate will rise forcibly, thus completely obstructing the view and preventing the introduction of the mirror into the pharyngeal cavity. This difficulty can be obviated by telling the patient to breathe through his nose, at the same time keeping the mouth open. After a little practice he will learn to do so, when the velum will drop and the mirror can be brought behind it, illuminating the vault of the pharynx and the posterior nares. Under no circumstances should the rim of the mirror touch the posterior wall of the pharynx, as otherwise the

palate will at once rise and obstruct the view. In order to prevent this great and chief obstacle to posterior rhinoscopy, a number of instruments have been devised to hold the velum forward and out of the way, but none of these so-called palate retractors have proved advantageous in my hands, and I have found that practice on the part of the patient, and a diminution of the irritability of the parts by local applications, will accomplish the purpose much better than any instrument could do.

In the case of operations in the post-nasal cavity, however, it is not only desirable but often absolutely necessary that the operator should be able to watch his instrument in the rhinoscopic mirror; then it becomes necessary to prevent a rising of the soft palate by mechanical means, and among all procedures devised for this purpose I prefer, by far, the method recommended by Dr. Jarvis, of New York, which is as follows:

An Eustachian catheter is first introduced along the floor of the nose until its curved end has passed into the pharyngeal cavity. Through this a piece of catgut of about the thickness of a "D" string used on violins is passed until its end appears in the pharynx below the margin of the palate, where it is grasped by a pair of forceps and drawn out through the mouth, the other end of the string still projecting from the nostril. The catheter is then withdrawn and a piece of narrow elastic tape, such as is found in every trimming store, is tied to the end of the string projecting from the mouth, and is drawn into the pharynx and out of the nose by the withdrawal of the catgut string, so that one of its

ends projects from the mouth and the other from the nose, thus making a loop around the soft palate. Another piece of elastic tape is then, in the same manner, passed through the other nostril and the ends secured by Jarvis's tape-holders. These are two small V-shaped spring clips so arranged that the tape passing through apertures is caught by a tooth-like projection and firmly held. Pressure on the blades of the clip releases the catch and sets the tape free.

The end of the tape projecting from the mouth of the patient is passed through the slit of the blade of the tape-holder to which the cross-bar or catch is fastened, and knotted to prevent its slipping out. The other end is passed through the slit of the other blade and also through the slit of the catch, which can readily be done by slightly compressing the blades of the tape-holder until the two openings come opposite to each other. The pressure being taken off, the cross-bar draws the tape down upon the blade of the instrument and firmly holds it there, thus preventing its slipping when sufficient traction has been made to draw the palate forwards. The strain of the two tapes passing around the velum can be conveniently regulated and nicely balanced, thus making their presence tolerable, and should efforts at gagging or vomiting show themselves, the elastic tapes can quickly be relaxed, giving the velum free play.

CHAPTER III.

ANATOMY AND THE NORMAL LARYNGEAL AND RHINOSCOPIC IMAGES.

ALTHOUGH the scope of this little manual is not sufficiently extended to enter at length into the consideration of the anatomy of the larynx and the pharyngeal and nasal cavities, yet it will be convenient, with a few words, to describe the anatomical relation of those parts to each other which form the laryngeal and the rhinoscopic images, before describing these latter when seen on the reflecting surface of the mirror.

The anatomy of the larynx and trachea, as well as of the nasal cavities, is so well understood and described by authors of text-books on general anatomy and physiology, that a very few sentences will suffice to refresh the reader's memory.

ANATOMY OF THE LARYNX.

The larynx is a funnel-shaped expansion of the trachea situated at the upper part of the air-passages. Its lower narrow part is circular, while its upper expansion presents a triangular appearance. It consists mainly of nine cartilages—three single and three in pairs—which are held together by ligaments, and are moved upon each other by numerous small muscles. The interior of this cartilaginous tube is

lined with mucous membrane, which is thrown into two pairs of folds and is covered with ciliated epithelium, except at the lower folds, the vocal cords, which are covered with tessellated epithelium. In examining the cartilaginous skeleton of the larynx (Fig. 20) the first object which attracts our attention

FIG. 20.

Hyoid bone and the laryngeal cartilages. (Ellis.)

G. Body of the hyoid bone. H. Large cornu. J. Small cornu. A. Epiglottis. B. Thyroid cartilage. C. Arytenoid cartilage. D. Cricoid cartilage. E. Upper cornu, and F. Lower cornu of the thyroid cartilage.

is a large and peculiarly shaped cartilage—the thyroid cartilage.

The *thyroid cartilage*, so called from its resem-

blance to an old Etruscan shield (θυρεός), is composed of three pieces—two lateral wings or alæ, and a centre-piece. Each wing is quadrilateral in shape, and is united to its fellow by the centre-piece at an acute angle, which, being only covered by skin, forms the projection in the anterior portion of the neck called the pomum Adami; more prominent in the male than in the female on account of the greater amount of adipose tissue in the latter.

The upper margin of the wings is deeply notched immediately above the greatest anterior projection of the pomum Adami, rising and falling as we trace it from before backward, so that it presents an S-shaped outline. The lower margin is less compli cated, having for its outline a simple curve from before backward.

The posterior border being rather thick and rounded, presents a wavy outline in a perpendicular direction, and terminates above in the superior cornu and below in the inferior cornu of the thyroid cartilage.

The outer surface of the alæ presents a roughened oblique ridge, which passes downward and forward, originating in a tubercular projection at the root of the superior cornu. The inner surface is smooth and is covered by mucous membrane.

The centre-piece, which was first described by Luschka, can only be seen by removing the perichondrium covering the cartilage. Its shape is that of a bottle, or pyramid, with its base downward. It is situated at the junction of the wings and forms the keystone to the arch of the whole cartilage. Its color is slightly different from that of the two wings,

being a shade more yellow, and a microscopic examination reveals the fact that it is composed of *fibrous* cartilage, while the wings and other cartilages of the larynx are of the *hyaline* type.

Cricoid Cartilage.—The thyroid cartilage is mounted upon the *cricoid cartilage*, which latter forms the lower expansion of the larynx. It has received its name from its striking resemblance to an old-fashioned signet-ring (κρίκος), the posterior part being broad and thick forms the crest-plate, while the anterior part is thin and narrow and forms the ring part. On the posterior plate we observe a ridge in the median line, which serves for the attachment of the *crico-arytenoideus posticus* muscle.

The superior border of the cricoid cartilage is directed upward and backward, owing to the great width of the posterior plate. It has a smooth and very slightly wavy outline, and is notched at the middle of the plate. On either side of this notch we observe a smooth oval surface which serves for the articulation with the arytenoid cartilages. The lower border is horizontal and also wavy, and is connected with the first ring of the trachea.

The Arytenoid Cartilages, so called from the resemblance they bear, when aproximated, to the mouth of a pitcher (ἀρύταινα), are two small, irregular pyramidal cartilages, which are mounted upon and articulated with the upper posterior margin of the cricoid cartilage. The posterior surface is smooth, triangular, and is bent backward. The anterior surface is convex and roughened, and to it the thyro-arytenoid muscle is attached. The internal surface is smooth and very narrow, concave, and

covered with mucous membrane. The base is concave and smooth, articulated with the cricoid cartilage, and presents two projections or processes in its margin. The anterior process serves for the attachment of the vocal cords, and is called the vocal process, to which in the female larynx is attached a small elongated piece of fibrous cartilage embedded in the cord, called the cartilage of *Seiler*, while the external process, which is shorter and more rounded than the vocal process, serves for the attachment of several muscles, and is called the muscular process.

The apex of the arytenoid cartilage is elongated and curved backward and inward. It is surmounted by a small nodule of cartilage, the cartilage of *Santorini*. Two small elongated cartilages are also placed in the ary-epiglottic fold.

Beside the cartilages already described, we find a thin lamella of fibrous cartilage inserted into the angle of the thyroid cartilage. This thin spoon-shaped cartilage, the *epiglottis*, serves to close the opening of the air-passages in deglutition. It is broad on its free end and narrow at the point of insertion, concave in its laryngeal surface and convex in its glossal surface.

The hyoid bone, although intimately connected with the larynx, does not belong to its cartilaginous skeleton.

Ligaments.—The cartilages of the larynx are connected by ligaments among themselves (intrinsic), and to other structures (extrinsic). (Fig. 21.)

The largest of these is the *thyro-hyoid membrane*, a broad fibro-elastic membrane attached below to the upper border of the thyroid cartilage, and above

to the upper margin of the posterior surface of the hyoid bone, being separated from the latter by a synovial bursa. It is somewhat thicker in the

FIG. 21.

Vocal apparatus, on a vertical section of the larynx. (Ellis.)
A. Ventricle of the larynx. B. Vocal cord. C. Ventricular band. D. Sacculus laryngis. E. Arytenoid cartilage. F. Cricoid cartilage. G. Thyroid cartilage. H. Epiglottis. K. Crico-thyroid ligament. L. Thyro-hyoid ligament.

middle than at either side, and is penetrated by both vessels and nerves.

Between the greater cornua of the hyoid bone and the superior cornua of the thyroid cartilage we

find two round elastic cords, strengthened by a small cartilaginous nodule, which are called the lateral thyro-hyoid ligaments.

Connecting the cricoid and thyroid cartilages is a triangular membrane of yellow elastic tissue. It is thick in front, where it connects the upper border of the cricoid cartilage to the lower margin of the thyroid, and thin on either side, where it has its upper insertion on the inner surface of the thyroid cartilage below the true vocal cords.

The articulation of the inferior cornua of the thyroid cartilage with the cricoid is enclosed in two *capsular ligaments* lined with synovial membrane. This articulation is a hinge-like joint which allows of a rocking motion of the thyroid cartilage upon the cricoid. The articulation of the arytenoid cartilage with the cricoid is also enclosed by capsular ligaments, lined with synovial membrane, and is of a ball-and-socket-joint character, allowing a rotatory motion of the arytenoid cartilage upon the cricoid, and also a sliding motion in a lateral direction and backwards, as well as a rocking forwards.

Epiglottic Ligaments.—The epiglottis is connected with the adjacent parts by several ligaments and folds.

1. By the hyo-epiglottic ligament to the hyoid bone. This ligament extends from the anterior surface of the epiglottis near its apex, to the posterior surface of the hyoid bone.

2. By the thyro-epiglottic ligament a narrow elastic band to the thyroid cartilage, where it is inserted in the angle of the cartilage just above the middle piece.

3. By the three glosso-epiglottic folds of mucous membrane by which the epiglottis is attached to the sides and base of the tongue, thus forming two large fossæ between them.

4. By the aryteno-epiglottidean or ary-epiglottic folds, which run from the sides of the epiglottis to the apex of the arytenoid cartilages and contain the cartilages of Wrisberg and of Santorini.

Muscles.—The muscles of the larynx proper are divided into two classes: those which act in moving the vocal cords, and those which are connected in the movements of the epiglottis. The muscles of the first class are again subdivided into muscles which stretch the vocal cords and approach them, and those which relax and separate them.

The *crico-thyroid* (Fig. 22) is the first to attract our attention by its size. It is triangular in shape, overlies the anterior and lateral portion of the cricoid cartilage, and has its origin below in the front and side of the cricoid cartilage. Its fibres pass obliquely upward, and are inserted into the lower and inner borders of the thyroid cartilage. When this muscle contracts it draws the anterior portion of the thyroid cartilage over the cricoid cartilage, thus lengthening and stretching the vocal cords.

The *crico-arytenoideus lateralis* which arises from the upper border of the side of the cricoid cartilage, and is inserted in the muscular process at the base of the arytenoid cartilage, revolves the arytenoid cartilage upon its base, thus approaching the vocal processes together with the vocal cords.

The *thyro-arytenoid muscle*, a muscle prismatic in its transverse section, which lies along the base of the

cords, arises from the base of the middle piece of the thyroid cartilage, and by a few fibres, which

FIG. 22.

View of the internal muscle of the larynx. (Ellis.)

1. Crico-thyroideus detached. 2. Crico-arytenoideus posticus. 3. Crico-arytenoideus lateralis. 4. Thyro-arytenoideus, superficial part. 5. Depressor of the epiglottis. 6. Thyro-hyoideus, cut. 8. Deep or transverse part of thyro-arytenoideus.

become gradually shorter from the inner side of the wings of this cartilage, is inserted into the base and anterior surface of the arytenoid cartilage.

Arytenoid Muscle.—The arytenoid muscle (Fig. 23), a single muscle, occupies the cavity formed by the posterior surfaces of the two arytenoid cartilages. It arises from the posterior surface and outer border of one arytenoid cartilage, and is inserted in the corresponding parts of the other cartilage. It

FIG. 23.

Hinder view of the larynx. (Ellis.)
A. Superficial part of the arytenoideus muscle. B. Deep part of the arytenoideus. C. Crico-arytenoideus posticus.

consists of three sets of fibres, two oblique and one transverse. The oblique and superficial sets pass from the base of one cartilage to the apex of the other, while the transverse fibres which lie below pass directly across.

This muscle, together with the preceding one, is regarded by Luschka as forming a sphincter or constrictor of the glottis. The thyro-arytenoid or vocal

muscle, when acting alone, will draw, however, the vocal cords asunder near their anterior insertion; while the arytenoid, if acting alone, will simply rotate the arytenoid cartilages outwardly, and thus separate the vocal processes. But both muscles acting together will narrow the glottis by approaching the cords.

The *crico-arytenoid*, a large fan-shaped muscle which occupies the depressions on either side of the median line of the posterior surface of the cricoid cartilage, arises from this surface. Its fibres, running obliquely upward, are collected into a short tendon, which is inserted into the posterior margin of the vocal process.

This muscle, when contracting, separates the vocal processes of the arytenoid cartilage by rotating them outwardly, and at the same time pulls the arytenoid cartilage downward.

The muscles of the epiglottis are three in number:

1. *Thyro-epiglottideus*, which arises from the inner surface of the thyroid cartilage, passes upward, and is partly lost in the ary-epiglottic fold, and partly inserted in the margin of the epiglottis. It acts as a depressor of the epiglottis.

2. *Aryteno-epiglottideus superioris*, a small slender muscle consisting of only a few bundles of muscular fibre, arises from the apex of the arytenoid cartilage, and is lost in the ary-epiglottic fold.

3. *Ary-epiglottideus inferioris*, arises from the anterior surface of the arytenoid cartilage. Its fibres pass upward and are inserted into the margin of the epiglottis.

The mucous membrane by which the interior of

the larynx is lined is thrown into folds, and, covering the cartilaginous projections and depressions of the skeleton, presents a surface of peculiar shape and form for examination.

We notice, first, the superior aperture of the larynx, a large triangular opening leading to the cavity proper of the larynx. It is bounded in front by the epiglottis, behind by the apices of the arytenoid cartilages, and laterally by the ary-epiglottic folds.

The cavity proper of the larynx (see Fig. 28) extends from this aperture to the lower edge of the cricoid cartilage. It is divided into two parts by the projections formed, inwardly, of the vocal cords, the upper and larger part being elliptical, while the lower and smaller is circular.

The vocal cords are two folds of mucous membrane covering the aryteno-thyroid muscle, and extend from the vocal process of the arytenoid cartilage to the angle of the thyroid cartilage, where they are attached to the middle piece of the thyroid cartilage. In phonation these bands approach each other with their free edges, and form a narrow chink or slit between them, called the *rima glottidis*. In ordinary breathing this opening becomes large and triangular in shape, the base of the triangle being formed by the upper margin of the posterior plate of the cricoid cartilage, and its sides by the edges of the vocal cords. The mucous membrane covering these cords is of a pearl-white hue, and devoid of ciliated epithelium.

At the base of the vocal cords the mucous membrane is again supplied with the ciliated variety

of epithelium, and runs upward and backward for a considerable distance, to be reflected and to come down again to almost the place whence it started, thus forming a deep pouch; it is again reflected and runs upward, covering the epiglottis. This duplicature of mucous membrane thus formed, which lies above the vocal cords and runs parallel with them, is called the ventricular band. The pouch spoken of, which is of variable size, and situated between the ventricular bands and the inner side of the thyroid cartilage, is named the sacculus laryngis, while its elongated, elliptical opening is termed the ventricle. In the submucous tissue of this pouch numerous glands are situated, which open into the sacculus, and whose secretion is intended to lubricate the vocal cords. The mucous membrane of the laryngeal surface of the epiglottis is also the seat of numerous glands, whose openings may frequently be seen by the naked eye.

The larynx is supplied with arterial blood by the laryngeal branches of the superior and inferior thyroid, while the veins empty into the superior, inferior, and middle thyroid veins.

The nervous force is supplied by the superior laryngeal and the inferior recurrent laryngeal branch of the pneumogastric, and also by a few fibres of the sympathetic.

The superior laryngeal supplies the mucous membrane and the crico-thyroid muscle, while the inferior laryngeal supplies all the other muscles. The arytenoid receives filaments from both the superior and inferior nerves. The recurrent branches of the pneumogastric are united by a *chiasm*, which fact,

before surmised, was established by experiments made on the body of a criminal by Dr. W. W. Keen and myself.

Besides the muscles described as belonging to the larynx proper, there are other muscles which by their action determine the position of the larynx in the throat. These are the so-called extrinsic muscles of the larynx, and comprise the sterno-thyroid, the thyro-hyoid, the omo-hyoid, and the sterno-cleido-mastoid.

Thyroid Gland.—The thyroid gland, a large ductless gland, divided into two lobes by the isthmus, is situated in the anterior part of the neck, overlying the trachea below the cricoid cartilage.

The Laryngeal Image.

Supposing that the mirror, after having been introduced, displays a complete image of the laryngeal opening, such as is seen in Figs. 24 and 25, we

Fig. 24.

Laryngeal image during respiration.

Fig. 25.

Laryngeal image during phonation.

observe a reddish-yellow arch, sometimes notched in the centre, with a roundish protuberance in front of it, of the same color, but not so well illuminated.

This arch is the upper margin of the *epiglottis*, and

the backward bend of the organ near its insertion into the angle of the thyroid cartilage. In front of this protuberance, extending across the surface of the mirror, are seen two pairs of bands, the outer reddish, and the inner pearl-white when normal. These are the ventricular bands and vocal cords. In quiet breathing a triangular space is noticed between the inner bands, with its apex posterior, and usually hidden by the arch of the epiglottis. In phonation this space is narrowed down to a slit, and is designated by the name *glottis*.[1]

In front, at the termination of the vocal cords, we notice two roundish prominences, with a depression between them, when the patient is breathing, but closely applied to each other in vocalization. These are the arytenoid cartilages as seen from above. On either side a curved band, with its concavity inward, extends backward to join the arch of the epiglottis. Along the course of these bands, which are the *ary-epiglottic folds*, we see two small nodules, the cartilages of Wrisberg and of Santorini.

In the female larynx we see, along the inner edges of the vocal cords, two yellowish stripes, very narrow and tapering toward their ends. These are the cartilages of Seiler, which are only rudimentary in the male larynx.

Behind and above the arch of the epiglottis, two dark oval spaces, separated by a light band running backward, are observed. These are the depressions

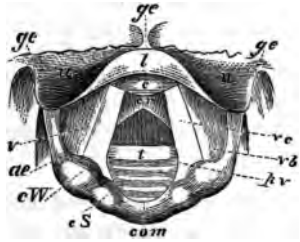
[1] The name *glottis* is frequently applied to the whole opening of the larynx, and in many books a very vague idea is given of its extent. By common consent, the term is applied to the space between the edges of the cords only.

on either side of the glosso-epiglottic fold, while the light band separating them is the fold itself (Figs. 26 and 27).

By directing the reflected light a little forward, we see back of these depressions a surface studded with round eminences—the back of the tongue, with its papillæ.

Through the glottis when fully opened we can see into the inferior cavity of the larynx below the vocal cords, where a broad yellow band, the *cricoid* cartilage, appears, and below it the rings of the

FIG. 26.



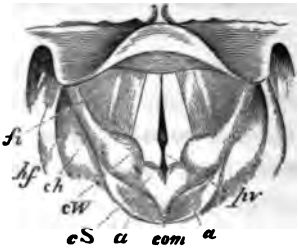
Laryngoscopic diagram showing the vocal cords widely drawn apart, and the position of the various parts above and below the glottis during quiet breathing. *g e.* Glosso-epiglottic fold *s. u.* Upper surface of epiglottis. *l.* Lip or arch of epiglottis. *c.* Protuberance of epiglottis. *v.* Ventricle of the larynx. *a e.* Ary-epiglottic fold. *c W.* Cartilage of Wrisberg. *c S.* Cartilage of Santorini. *com.* Arytenoid commissure. *v c.* Vocal cord. *v b.* Ventricular band. *p v.* Processus vocalis. *c r.* Cricoid cartilage. *t.* Rings of trachea. (From Mackenzie.)

trachea elevating the mucous membrane. Not infrequently, two dark circles separated by a bright line may be seen in the depths of the trachea, indicating the openings of the bronchi, and the bifurcation of the trachea. In very rare instances a beam of light can be thrown into the right bronchus, but very little can be seen under such circumstances, as

everything is very indistinct and differences of color cannot be determined.

The normal color of the mucous membrane is a pinkish-red, varying in shade in different localities.

FIG. 27.



Laryngoscopic diagram showing the approximation of the vocal cords and arytenoid cartilages, and the position of the various parts during vocaliztion. *fi.* Fossa innominata. *hf.* Hyoid fossa. *c h.* Cornu of hyoid bone. *c W.* Cartilage of Wrisberg *c S.* Cartilage of Santorini. *a.* Arytenoid cartilages. *com.* Arytenoid commissure. *p v.* Processus vocalis and cartilages of Seiler. (From Mackenzie.)

Thus, the epiglottis is usually of a yellowish tint, caused by the shining, through the thin layer of mucous membrane, of the cartilage. The pearly white of the vocal cords, which has already been mentioned, serves as a landmark to the beginner in laryngoscopy. There may be, however, considerable variation of color in the mucous membrane within the limits of health, in different individuals, and even in the same individual under different circumstances, as, for instance, after a meal the mucous membrane is darker than before meals, and when viewed by a white light, as already mentioned, it appears lighter than when a yellow light is used for illumination.

The shape of the different parts also may vary

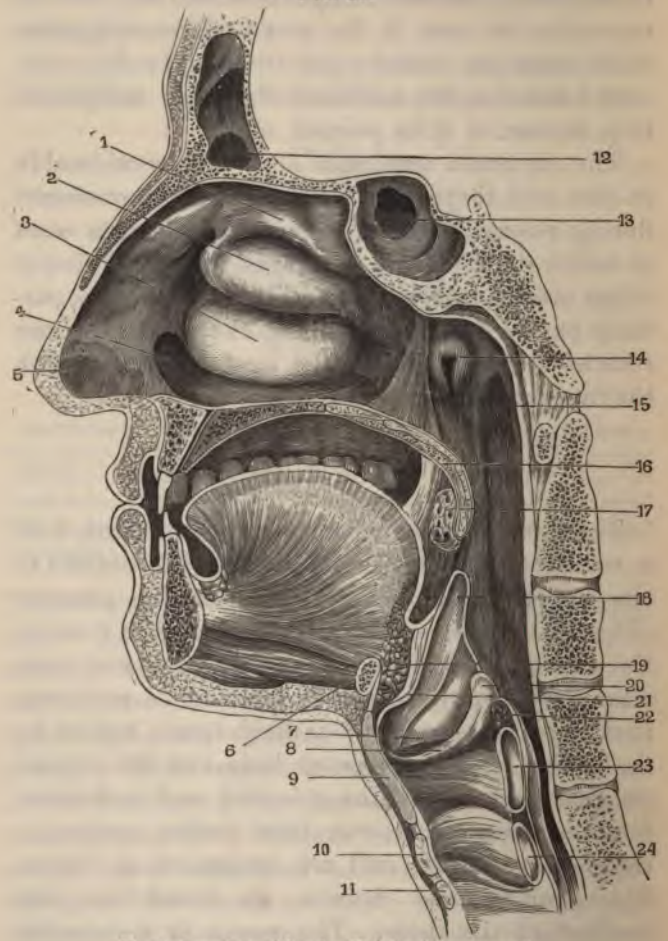
considerably without being abnormal, and this is especially the case in the shape of the epiglottis, which may be curled upon itself or be flat, may have a notch in the middle of the upper margin, or may, instead of it, be pointed, etc.

The arytenoid cartilages also vary considerably in size and shape, and even in their movements during phonation, for I have frequently seen cases in which the arytenoid cartilages, instead of simply being pressed against each other in phonation, partially passed each other, so that the vocal processes seemed to lap without in the least interfering with the function of the vocal cords.

Anatomy of the Nasal Cavities.

The nasal cavities, which are wedge-shaped, with a narrow arched roof, extend from the nostrils to the upper portion of the vault of the pharynx (Fig. 28). Their outer walls are formed in front by the nasal process of the superior maxillary and lachrymal bones, in the middle by the ethmoid and inner surface of the superior maxillary bones, behind by the vertical plate of the palate bone, and the internal pterygoid process of the sphenoid and turbinated bones. These latter run from before backward, three on each side, and are designated as the inferior, middle, and superior, the latter being the smallest of the three. The spaces or sinuses between these turbinated bones are called meatuses, so that the space between the floor of the nose and the lower turbinated bone is called the inferior meatus, the one between the lower and middle tur-

FIG. 28.



Vertical section of head; slightly diagrammatic.

1. Superior turbinated bone. 2. Middle turbinated bone. 3. Lower turbinated bone. 4. Floor of nasal cavity. 5. Vestibule. 6. Section of hyoid bone. 7. Ventricular band. 8. Vocal cord. 9 and 23. Section of thyroid cartilage. 10 and 24. Section of cricoid cartilage. 11. Section of first tracheal ring. 12. Frontal sinus. 13. Sphenoidal cells. 14. Pharyngeal opening of Eustachian tube. 15. Rosenmüller's groove. 16. Velum palati. 17. Tonsil. 18. Epiglottis. 19. Adipose tissue behind tongue. 20. Arytenoid cartilage. 21. Tubercle of epiglottis. 22. Section of arytenoid muscle.

binated bone is the middle meatus, and the one between the middle and superior turbinated bones is the superior meatus.

The nasal cavities are separated from each other by a septum or division-wall, composed of the perpendicular plate of the ethmoid bone and the vomer posteriorly and the cartilaginous septum anteriorly, thus presenting a smooth surface as the inner wall of each cavity.

The floor is formed by the palatine process of the superior maxillary bone and by the palate bone, and runs in a slanting, downward direction from before backward. The roof is formed by the nasal bones and nasal spine of the frontal in front, in the middle by the cribriform plate of the ethmoid, and posteriorly by the under surface of the body of the sphenoid bone. Directly communicating with the nasal cavities by narrow channels are other cavities, situated in the bones of the skull, the lining mucous membrane of which, no doubt, is largely affected by the pathological processes in nasal diseases. These are the antra of Highmore—large triangular cavities situated in the body of the superior maxillary bone, and communicating with the nasal cavities by an irregularly shaped opening in the middle meatus; then the frontal sinuses—two irregular cavities situated between the two tables of the frontal bone. The communication between them and the nasal cavities is established by the infundibulum—a round opening in the middle meatus—and finally the sphenoidal cells or sinuses found in the body of the sphenoid bone, communicating with the nasal cavities by small openings in the superior meatus.

That portion of the nasal cavities which projects beyond the end of the nasal bone is surrounded by cartilages, forming the alæ of the nose.

In the cartilaginous septum of the lower animals we find a small cavity lined with mucous membrane, called, after its discoverer, Jacobson's organ, the minute anatomy of which has lately been described by Kline.[1] This organ in man is, however, only rudimentary.

The nasal cavities are lined with mucous membrane, which varies greatly in thickness in different localities, and which materially decreases the size of the cavities in the living subject from that seen in the denuded skull. This mucous membrane is covered by ciliated epithelium in man, with the exception of that portion which lines the vestibule, *i. e*, that portion of the cavities of the nose surrounded by cartilage only, which is covered by pavement epithelium. In the lower animals we find that in the olfactory region the ciliated epithelium is either absent, or that ciliated and non-ciliated epithelium alternate in patches.[2] I have not been able to find a statement in the literature on the subject as to the kind of epithelium found in the accessory cavities in man, but it is very probable that the mucous membrane of the frontal sinuses and the antra of Highmore is covered with ciliated epithelium, otherwise it would be difficult, if not impossible, for the secretions of that mucous membrane to pass through the narrow channels into the nasal cavities. The color of the normal nasal mucous membrane is of a

[1] Quarterly Journal of Microscopical Science, January, 1881.

[2] Henle, Anatomie des Menschen, vol. ii.

light pink shade in what is termed the respiratory portion, while it is of a yellowish hue in the olfactory region, that portion of the mucous membrane which covers the roof and outer wall of the nasal cavities down to the upper margin of the middle turbinated bone, and the septum down to about the same level. It is in this region that the nerve-ends of the olfactory nerve are distributed. Immediately beneath the mucous membrane, and between it and the periosteum of the bony walls and the perichondrium of the cartilaginous portion of the septum, we find a tissue which bears a striking resemblance to the erectile tissue of the genital organs.[1] It is a network of fibrous tissue, the trabeculæ of which contain a few organic muscular fibres. Its meshes, of various sizes and shapes, are occupied by venous sinuses lined with endothelium. These are supplied with blood by small arterioles and capillaries, which are quite numerous in the fibrous tissue and can readily be demonstrated under the microscope. In this arrangement of elements of the nasal mucous membrane we find a ready explanation of the fact that liquids of greater or less density than the serum of the blood, when introduced into the nasal cavities, produce pain, for we have here the most favorable conditions for osmosis, which will cause either a contraction or a distention of the sinuses. In the larger masses of fibrous tissue between the sinuses or caverns we find embedded the glands, with their ducts opening out between the epithelial cells of the mucous membrane. There are two

[1] Henle, loc. cit.

kinds of glands in this region, which have been described by Kline,[1] viz., serous and mucous glands.

This cavernous erectile tissue is most abundant at the lower portion of the septum and the lower turbinated bone, and although it has been recognized and described as true erectile tissue by Henle, Virchow, and others, yet to Prof. Bigelow, of Boston, belongs the honor of having first called attention to the part which this tissue plays in nasal disease. He gave to it the name "turbinated corpora cavernosa."[2]

The naso-pharynx, into which the nasal cavities open by the posterior nares, contains the openings to the Eustachian tubes on either side, and the pharyngeal tonsil, a mass of glands situated below the mucous membrane and opening into a number of follicles, some of which are quite large and readily seen in the rhinoscopic mirror.

The Rhinoscopic Image.

On account of the velum palati and the uvula covering the greater part of the reflecting surface of the mirror in rhinoscopy, a complete image can only be obtained in cases of cleft palate; but, by observing the different parts of the posterior nares in turn, a diagrammatic image can be constructed, which is, perhaps, for study, even better than one drawn from nature. Such a drawing is seen in Fig. 29.

We see in the middle of the drawing a triangular plate with its apex downward; this is the posterior margin of the vomer or nasal septum. On either side we notice curtain-like folds projecting toward

[1] Loc. cit. [2] Boston Medical and Surgical Journal.

the septum; these are the posterior aspects of the turbinated bones. On either side of these and on the margin of the drawing we notice pointed elevations projecting toward the interior of the cavity, with a crater-like depression on their apices; these

FIG. 29.

Rhinoscopic image.

1. Vomer or nasal septum. 2. Floor of nose. 3. Superior meatus. 4. Middle meatus. 5. Superior turbinated bone. 6. Middle turbinated bone. 7. Inferior turbinated bone. 8. Pharyngeal orifice of Eustachian tube. 9. Upper portion of Rosenmüller's groove. 11. Glandular tissue at the anterior portion of vault of pharynx. 12. Posterior surface of velum.

are the lateral pharyngeal walls, with the orifices of the Eustachian tubes. Above we see the vault of the pharynx, and below the posterior surface of the velum palati with the uvula.

The obstacles which have to be overcome in obtaining a view of the posterior nares are, first, the elevation of the back of the tongue, which, as we have seen, can be surmounted by gentle pressure with the tongue-depressor, and, second, the elevation

of the soft palate. This latter, however, does not, as a general rule, prevent an inspection of the nasal cavity; for the velum drops in the act of inspiration through the nose, even if only for a short time.

If the uvula is elongated or very large, it is difficult to obtain a satisfactory view of the posterior nares, and it becomes necessary to move it out of the way. This may be done in many cases by passing another small rhinoscopic mirror behind the uvula and velum, with the glass side toward the posterior upper surface of the palate. In this way the swollen uvula may be lifted up, and by gentle pressure the velum drawn forward, thus increasing the space in the pharynx, and removing the obstacles to rhinoscopy. If, however, the patient, as is often the case, cannot bear this, a silk suture may be looped around the base of the uvula, and gentle traction having been made, the ends of the thread are secured between the teeth of the patient, thus drawing the uvula forward and out of the way. This, however, is but rarely necessary, except in cases of operations in the naso-pharynx, and then Jarvis's method of securing the soft palate, already described, is preferable.

Although apparently simple and easy, the art of laryngoscopy and rhinoscopy is a difficult one, and requires careful training of the hand and eye to become proficient in it. For this reason the student should not become discouraged if, after a few trials, he is not able to see the vocal cords or the posterior nares in the mirror, but should keep on undaunted until he has attained the necessary skill in placing the mirror in the right position, and throwing the

light from the head-reflector in the right direction, when without difficulty he will be able to obtain the laryngeal or rhinoscopic image. But in a large number of cases, unaccustomed to the presence of the mirror in the fauces, he will be able to see this image for a moment only before gagging sets in, and the mirror has to be removed. The mirror may be introduced again and again, and thus a series of momentary pictures may be obtained, which must be combined in the mind of the observer to form the permanent mental impression of the pathological changes which may exist in a given case. In order to facilitate this mental process, and to educate the eye so that many, if not all, the details forming the image may be taken in and recognized at a momentary glance, it is best that the student should adopt a system of examination, to be followed in every instance, by which one detail after another forms the centre of observation. The following outline of a system will make my meaning clear.

First examine the tongue: whether there are any ulcerations or mucous patches, whether coated or clean, pale and flabby, or of a natural color and resistance. Then, after having depressed the tongue, observe the palate and uvula, the anterior pillars, the tonsils, and posterior pillars, and the posterior wall of the pharynx, and note any changes in color of the mucous membrane and condition of its surface, enlargement of the parts, as, for instance, hypertrophy of tonsils, elongation of uvula, enlargement of follicles in pharynx, etc.; the presence or absence of foreign bodies, hardened secretion, abrasions or ulcerations of the mucous membrane; and finally,

mobility and functional disturbances of the parts. The laryngeal mirror may then be introduced and the details of the image examined, always retaining the order in which the physical and functional conditions of the parts are to be observed, viz., 1. Color and condition of surface of the mucous membrane. 2. Size and shape. 3. Loss of substance (ulcers, abrasions, etc.). 4. Presence of foreign bodies or accumulation of secretion; and 5. Mobility of parts and functional disturbances. Thus it will be found convenient first to examine the epiglottis and its appendages, the glosso-epiglottic and the ary-epiglottic folds, then the arytenoid cartilages, next the ventricular bands, and finally the vocal cords. If possible, also the trachea as far as it can be seen. In the same manner should the rhinoscopic image be viewed, taking note first of the condition of the pharyngeal tonsil and the roof of the naso-pharyngeal cavity, next of the openings of the Eustachian tubes and the lateral walls of the cavity, and finally of the posterior aspects of the turbinated bones and of the vomer.

The inspection of the anterior nares should be conducted in the same systematic manner, using the probe to test the consistency of the parts by the sense of touch.

An examination of the upper air-passages conducted on this plan, will enable the observer to arrive at a definite conclusion in regard to diagnosis more quickly and with less annoyance to the patient, than if he should attempt to take in all the details at a glance. As the examination progresses, the result of the observations can be jotted down on

paper, and thus a very complete record of the case will be obtained, especially if any deviations in shape or size of the parts, or the presence of foreign bodies or neoplasms, be sketched on the margin of the sheet, which will be valuable not only for future reference, but also in watching the progress of the case. The subjective symptoms, such as, cough, pain, etc., should of course be added, as well as the salient points of the previous and family history of the patient.

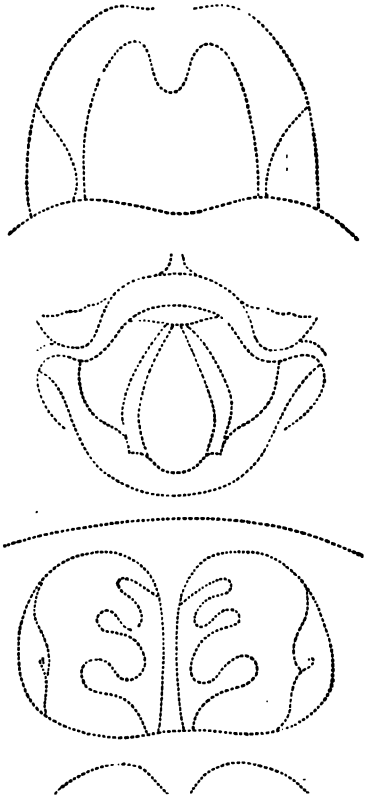
A record sheet of this kind on which the headings are printed and the outlines of the parts added, will serve as an illustration, and it will be seen that a very full history, with a minimum of trouble and expenditure of time can be obtained by filling in the blanks.

Name, etc., of patient.....

Previous and family history.....

Subjective symptoms.....

		Color and Surface.	Secretion.	Position and Shape.	Mobility.	Foreign Bodies and Neoplasms.
Fauces.	Tongue,					
	Velum,					
	Uvula,					
	Pillars,					
	Tonsils,					
	Wall of Pharynx					
Larynx.	Epiglottis,					
	Ary-epiglottic Folds,					
	Arytenoid Cartilages,					
	Ventricular Bands,					
	Vocal Cords,					
	Trachea.					

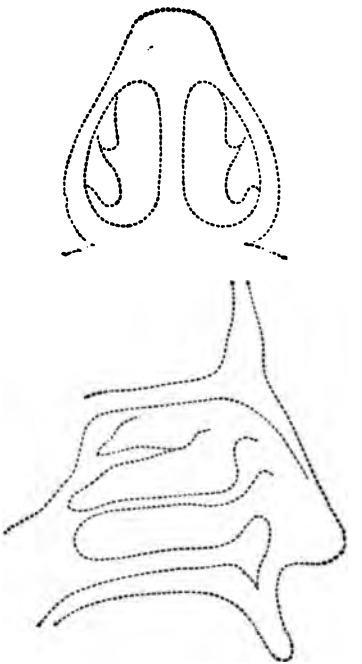


Naso-Pharynx.

- Vomer,
- Turbinated Bones,
- Eustachian Tubes,
- Pharyngeal Tonsil.

Nasal Cavities.

- Turbinated Bones,
- Septum,
- Floor of Nose,
- Meatuses.



CHAPTER IV.

INSTRUMENTS ACCESSORY TO LARYNGOSCOPY AND THE TREATMENT OF LARYNGEAL DISEASES.

HAVING described the laryngoscope, the different modes of using it, and the appearances of the normal laryngeal and rhinoscopic images, it remains to describe some instruments which, in connection with the laryngoscope, are used for making further exploration of the parts by the sense of touch and for making application to the diseased mucous membrane of the throat and nose. The instruments used for the extraction of foreign bodies and the removal of neoplasms, as well as for the performance of other operations within the cavities of the throat and nose, will be treated of under their respective heads.

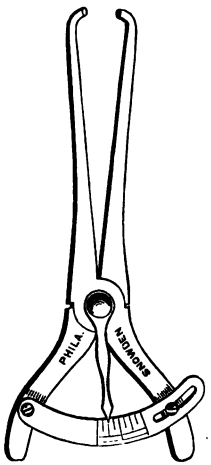
The Laryngeal Sound.—The eye is frequently unable to determine certain conditions seen in the laryngoscopic mirror, and others seen without it in the pharyngeal and nasal cavities. Hence the sense of touch aiding that of sight is frequently necessary in order to form a correct opinion as to the condition of the parts. For this purpose in laryngoscopy, as in surgery, a sound is employed.

The laryngeal sound consists of a piece of silver wire rounded off at the end, and held in a mirror handle. It should be flexible, so that any desired

curve can be given to it, but should be stiff enough to resist a considerable amount of pressure before yielding, and it should be long enough to reach to the anterior angle of the glottis without bringing the fingers holding the handle into the mouth of the patient, and thus obstructing the view. By means of the sound, attachments of tumors, depths of ulcers, etc., are determined.

It is often difficult, if not impossible, to determine with the eye or sound alone, whether a bulging of the nasal septum to one side or the other is due to a

FIG. 30.



Septometer for measuring thickness of nasal septum.

bend or deviation from the normal position, or whether it is due to localized thickening of the plate. This may be ascertained by means of my nasal calipers, an instrument similar to the one used by mechanics to determine the diameter of a piece of wood or iron being turned in the lathe (Fig. 30).

In using it the long straight shanks are introduced, one in each nostril, and being closed upon the septum the rounded points are gently moved up and down, and backwards and forwards over the bulging portion of the septum. The motion of the index attached to the curved shanks of the instrument accurately indicates the *relative* thickness of tissue grasped between the points in the nose. By means of this instrument we can thus ascertain whether we have to deal with a deviation or a localized thickening of the septum, for if it is a deviation the index will move but slightly, while it will travel a considerable distance when the points pass over a thickened portion.

Sponge-holder.—Most remedies employed as applications to the mucous membrane of the throat and nasal cavities are used in solution. They may be applied either with a sponge, a tuft of cotton, a brush, or as a finely subdivided spray.

A small piece of fine sponge tied securely to the end of a bent silver wire or sound, and dipped into the solution to be used, can be carried to any desired spot in the larynx, pharynx, or nasal cavities. This constitutes what is called a sponge-holder. As it is necessary to renew the piece of sponge with every application, it is more convenient to employ an instrument made for the purpose, to which the piece of sponge can be quickly and securely fastened. The already-described epiglottis forceps may with advantage be employed for this purpose. A piece of wire bent to the proper curve, split at the end and secured in a wooden handle, is, however, generally used as a sponge-holder. A sliding ring

slipped over the split end serves to approximate the two halves, thus securely holding a piece of sponge between them (Fig. 31). The sponge should be small, only large enough to cover the ulcer or abrasion, to which *alone* it is to be applied. The old-

FIG. 31.

Sponge-holder.

fashioned whalebone probang, with a large piece of rough sponge tied to the end, is altogether unfit for any application to the delicate mucous membrane of the throat.

Cotton Applicator.—When applications of liquid are to be made to lesions in the pharynx or the nasal cavities, it will be found that a tuft of absorbent cotton attached to the roughened end of a silver or aluminium probe is often preferable to the sponge, because the closer texture of the cotton holds the liquid better, and there is less danger of a drop becoming detached during the application and running down, causing irritation. The cotton should be wound around the end of the probe in such a manner, that by a little twist of the fingers it can be detached after the application has been made. If, however, it adheres so tightly to the probe that it cannot be easily pushed off, the simplest way to get rid of it is to burn it off by holding the end of the probe carrying the cotton over the lamp, and allowing it to become charred, when it can readily be

wiped off. For applications to the anterior nasal cavities I am in the habit of using the ordinary wooden toothpick as cotton carriers, and throwing them away after having made the application, thus saving time and trouble.

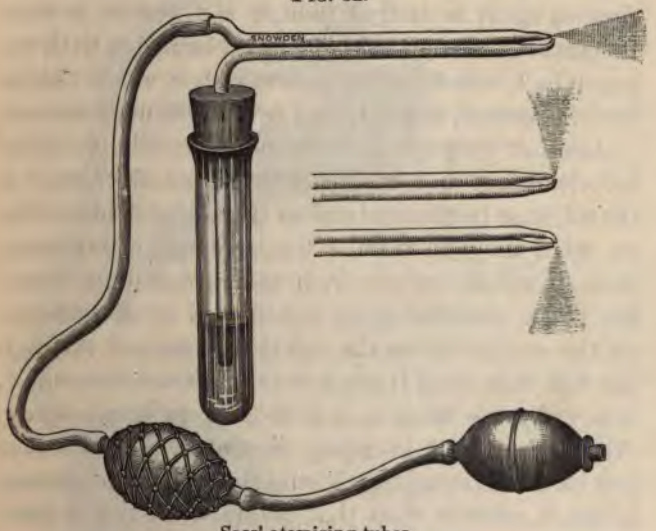
The Brush.—In many cases a soft camel's-hair brush securely fastened to a *stiff*, curved stem may be advantageously employed for touching ulcers or abrasions in the pharynx and larynx. The brushes should be mounted in a cap of hard rubber, which can be screwed to the end of a silver laryngeal probe. Frequently, brushes are sold mounted in brass caps; these are not to be recommended, as the reagents used for applications attack the brass and loosen the hair, so that single hairs, and even large tufts of hair, come out of the brush and are apt to remain in the throat of the patient, causing very unpleasant symptoms.

Another kind of brush is sold as a laryngeal brush, which is tied to a slender wire, having loops at the end for a handle. This kind is very unsatisfactory, inasmuch as the stem is too thin and elastic, and consequently it is very difficult, or almost impossible, to touch any desired spot in the larynx or pharynx with the point of the brush.

The Atomizer.—In most forms of throat and nasal disease the application of solutions in the form of a spray is extremely useful, not only with a view to cleanse the mucous membrane of secretions before making applications with the sponge, brush, or cotton pledget, but also as a means of spreading medicated solutions over a larger surface, and of gaining access to parts which can in no other way

be reached. The spray is produced by means of an atomizer, of which a large variety, of different degrees of usefulness, may be obtained from the instrument makers. The best of these are the so-called Sass' atomizing tubes (Fig. 32) made of glass,

FIG. 32.



Sass' atomizing tubes.

and throwing an extremely fine spray, either straight forward, upward, or downward. They work on what might be called the exhaust principle, in which a current of air being forced through a tube, on passing out from the small opening at the end, rushes past the opening of another tube, the end of which is below the surface of the liquid to be nebulized. In doing so, the current exhausts the air in the second tube, thus causing a rise of the liquid until it appears at the opening, when it is

carried along with the current of air in a finely subdivided state.

The current of air may be obtained by means of the well-known rubber-ball pump (see Figs. 32 and 33), which, by being compressed in the hand, forces a puff of air through the tube. If a continuous spray is desired (which is the case in most instances), a second rubber ball is connected with the pump ball, which, acting as a reservoir, stores the air under pressure, thus producing a continuous stream.

Another very good instrument, especially useful for cleansing and medicating the nasal cavities is the toilet or perfume atomizer (Fig. 33). This works on what may be termed the principle of compression, in which the air from the rubber bulb enters the bottle containing the liquid, and by its pressure on the surface forces the solution to ascend through the fine tube until it reaches the contracted opening, where, by the friction, it is broken up into a spray. Although useful in many instances, this atomizer has its disadvantages. In the first place, the stream is much coarser than that obtained from the Sass' tubes; secondly, being made of metal, solutions containing salts of iron, copper or silver, or acids, cannot be used with it, as they would corrode the tube and close its fine opening; and finally, it throws the stream only in one direction, namely, straight forward. Atomizers working on the same principle, made of hard rubber, and with movable tips, enabling the operator to throw the stream in any direction, thus avoiding the objections to the perfume atomizer, may be obtained, but they are so large and clumsy as to be almost useless.

FIG. 33.

Perfume atomizer, with double ball.

For office use, where the spray is used largely, the working of the hand-ball pump is not only very tedious, but also has the great objection of occupying both hands of the operator, one in holding the atomizer and the other in working the ball, and thus it becomes necessary to have a supply of air under pressure which can be used at any moment. For this purpose the Burges' blowpipe, to which a large reservoir with pressure-gauge is attached, forms a very convenient and cheap apparatus (Fig. 34). It is composed of a small air-pump, worked

FIG. 34.

Burges' air-compressor.

by the foot, forcing air into the reservoir, which, when the desired pressure (ten to fifteen pounds, as indicated by the gauge) is obtained, should be shut off from the pump by a stop-cock, to prevent leak-

age through the valve. To another stop-cock at the top of the reservoir is attached a long flexible rubber tube, the end of which is slipped over the end of the air-tube of the atomizer. The stop-cock being opened, the air rushes through the tube and produces the spray, which can be instantly stopped by bending and pressing the rubber hose against the opening of the air-tube with the hand holding the

FIG. 35.

Water air-pump.

atomizer, and without the necessity of closing the stop-cock in the reservoir. Thus the operator has perfect control over the instrument with one hand, and is free to hold the tongue of the patient or manipulate the nasal speculum with the other. The air used from the reservoir must be replenished by pumping as the pressure diminishes. By means of a very ingenious air-pump (Fig. 35), worked by a

stream of water this inconvenience is obviated, for the apparatus always keeps a certain pressure in the receiver. A regulator which is attached to it enables the operator to set the pump so that there are always, say, fifteen pounds of pressure in the receiver, and that when this has been obtained the pump automatically stops work, to begin again immediately as soon as the pressure has diminished in the reservoir. It can be attached to any stationary washstand, and will give as a maximum the pressure of the water in the hydrant pipe, which is usually from fifteen to twenty pounds. Of course, any kind

FIG. 36.

Steam atomizer.

of air-pump and reservoir will answer the purpose as long as the necessary air-pressure can be obtained and controlled at the will of the operator.

When the spray application is to be made frequently at the house of the patient, and especially when it is to be long continued, the steam atomizer (Fig. 36) is the most serviceable instrument for the

purpose. It, like the Sass' tubes, acts on the exhaust principle, but instead of using a current of air to nebulize the liquid, steam from a small boiler, to which the air-tube is attached, supplys the necessary force. The stream of atomized liquid cannot, however, be directed to any particular part, and the patient must draw it into his larynx during the act of inspiration. In order to protect his face from the moisture the spray is directed through a sort of funnel, the narrow end of which the patient holds in his mouth.

Liquids containing gums or resins cannot be used in atomizers, because they clog the fine opening of the tube. As they are mostly volatile in a greater or less degree, they may be employed to advantage for inhalations in a different way.

Vapor Inhalations.—The simplest, but nevertheless a very effective, method of using resinous liquids containing volatile ingredients is to mix them with hot water in a tumbler or cup, over which the wide end of a funnel or paper cone is placed, while the vapor rising from the mixture is inhaled by deep inspirations from the narrow end of the funnel or cone.

A more convenient instrument for such inhalations is the so-called inhaling bottle, a wide-mouthed vial holding from four to six fluidounces. Its air-tight-fitting stopper of cork or rubber is perforated by two holes, each admitting a glass tube, one of which is straight, and long enough to reach from the top of the stopper to within a fraction of an inch of the bottom of the bottle; the other tube is slightly bent, and is pushed through the stopper

until its lower end just protrudes below the under surface, the other end projecting several inches above the upper surface of the stopper. When it is to be used, the bottle is half filled with hot water, and a little of the resinous liquid is added to it. The stopper with the tubes is then replaced, and a deep inspiration is drawn through the bent tube. This causes a tendency to a vacuum in the bottle above the surface of the liquid, and a consequent rush of air through the straight tube, which on reaching the bottom of the vial bubbles up through the liquid and becomes impregnated with the volatile substances.

By inserting a small homœopathic vial in the stopper, and bending the upper end of the long tube in the form of a hook, so that the opening of the tube fits over the opening of the small vial, the bottle can also be used for the inhalation of the fumes of muriate of ammonium. In order to obtain the latter, the large bottle is half filled with cold water, to which a few drops of strong aqua ammonia are added. The small vial is half filled with chemically pure hydrochloric acid. By exhausting the air in the bottle, the atmospheric pressure causes the fumes of the acid to pass down the tube and up through the ammoniated water. Combining with the ammonia the acid forms the muriate of ammonia in the state of dense white vapor.

In certain cases of spasmodic affections of the larynx the inhalation of the vapors of nitrate of potash is used with very good results. Such vapors may be obtained by burning in a large jar, over which a funnel is placed, a piece of paper which has

been soaked in a saturated solution of nitrate of potassa and then dried.

Insufflator.—Remedies are often applied to the throat in the form of an impalpable powder, and for this purpose an instrument called an insufflator is used (Fig. 37).

FIG. 37.

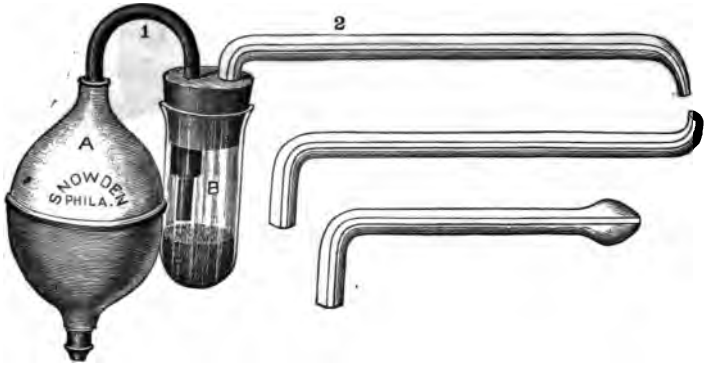
Insufflator.

It consists of a tube of hard rubber or metal curved at one end, and connected with a soft rubber ball at the other. Near the ball an elongated opening is cut into the side of the tube, which may be closed by sliding over it a short piece of another tube. When the instrument is to be used, the powder is placed in the opening, which is then closed by the sliding tube, and the ball is compressed suddenly, thus causing a puff of air, which carries the powder with it.

For office use I have devised a reservoir insufflator, which I have found very convenient (Fig. 38). This instrument consists of a small hard-rubber or glass vessel with a stopper containing two holes, one of which admits the tube leading from the ball or air receiver, while in the other is inserted the longer tube intended to emit the powder. The air-tube reaches down to within a short distance of the bottom of the vessel, and is bent at a right angle as it leaves the

stopper. To it is attached a rubber ball containing a valve or the rubber tube from the air receiver. The other tube, also bent at right angles just above the stopper, reaches down but a short distance into the vessel. The portion outside is bent in the curve seen in the ordinary insufflator, when it is to be used to

Fig. 38.



throw powder into the larynx; or it is straight and drawn to a point when it is to be employed for the anterior nares. The tubes being pushed into the hole of the vessel, one can be substituted for the other as the case may require. The advantages of this form of insufflator are that as the current of air passes into the reservoir containing the powder it stirs it up and passing out by the other tube carries with it only the finer particles, while the coarser and heavier ones which might give rise to irritation remain in the box. It also obviates the difficulty of loading the instrument every time it is to be used.

An insufflator may be improvised by using a piece of glass tube or a piece of stiff writing paper rolled

over a lead pencil, into which the powder is introduced and blown out by the breath of the physician.

The Caustic-holder.—Nitrate of silver, when it is to be applied to ulcers in the larynx or pharynx, in the solid form, should be fused on to the roughened end of a silver probe by holding both the end of the stick of nitrate of silver and of the probe over a lamp, and causing the caustic to melt, when it will adhere to the probe in the form of a drop, which retains its shape on cooling. This method is much safer and more economical than the use of solid nitrate of silver by the *porte-caustique;* because in the latter instrument the piece of caustic is apt to break, and the detached particle to drop into the larynx or trachea. Besides, in order to destroy any infectious material from a specific ulcer, the stick of nitrate of silver has to be washed, whereby a great deal of its substance is dissolved and lost. The probe, on the other hand, has but a thin coating of silver upon its end, which cannot easily break off, and can be readily remelted over the lamp, thereby destroying all infectious material that might cling to it.

CHAPTER V.

CATCHING COLD, PATHOLOGY OF MUCOUS MEMBRANE, THERAPEUTICS.

Catching Cold.—As most of the diseases of the upper air-passages are caused more or less directly by what is popularly known as catching cold, I will here in a few words endeavor to explain the meaning of this term before entering upon the consideration of the general pathology of the mucous membrane.

It is a well-known fact that the human organism must be maintained under all circumstances at a temperature equal to 98° Fahr., otherwise disease will result, and that the source of this heat is within the organism, the expenditure of which by radiation we endeavor to minimize by living in houses and by protecting the surface of the body with clothes.

The first part of this proposition is an accepted fact and self-evident, while the second needs some further explanation.

Heat is produced in the animal organism in two ways: first, by oxidation of food, and second, by the conversion of muscular movement into heat, according to the now well-established law of the correlation of forces. How and where this oxidation of food takes place I will not here enter into, but will state that certain articles of food yield a larger

amount of heat than others. Thus animal food, and especially animal fats and oils, produce more heat when introduced into the system than farinaceous food and fruits do. This we find exemplified in contrasting the mode of living of the Esquimaux and other inhabitants of the north with those dwelling in the tropics.

The Esquimau lives almost exclusively on animal food and fish oil, while the South-sea Islander, who lives most of the time in an atmosphere the temperature of which is higher than the normal temperature of his body, eats chiefly fruits and vegtables. And even in temperate climates, where man lives both on vegetable and animal food, more of the former is consumed during the warm season, while the latter is in preponderance during the cold winter months. The Catholic church has long ago recognized this fact, and has introduced the lenten season, a period of abstinence from animal food, at a time of the year when the seasons change from the cold to the warm, for if more heat-producing food is taken into the system than is required to keep the body at the normal temperature, the digestive system is taxed beyond its capacity, the blood is overcharged with effete material, which is not eliminated quickly enough, and as a result, we feel out of health, which, when it occurs during the first warm days of spring, we call spring fever. The same effect is produced when we change our abode from the North to the South during the winter months, and persist in the same mode of living, and take the same amount of animal food; and if we continue to live this way for a length of time, the

result is congestion, and may be abscess of the liver. This is exemplified by the fate of so many Englishmen who go to India, where they eat their roast beef and drink their heavy ales, as they have done in England, but who in a few years have to return with a diseased liver, blaming the climate when they should blame themselves.

In order to oxidize the food, oxygen must be introduced into the system in sufficient quantity, through the lungs, otherwise part of the food only is burnt up and produces heat, while the rest is thrown out again as waste material, and by its presence materially interferes with normal action of the different organs.

Muscular exercise, as is well known, produces heat within the system by a conversion of motion into heat, but this motion depends for its sustenance upon the contractile force of the muscles, which is kept up by part of the food taken into the system. If this contractile force of the muscles is not exercised, it needs not as much nourishment, and the surplus is deposited as fat within and around the different organs. This is exemplified by the fact that in order to fatten an animal, it is kept confined within a narrow space and is overfed.

There can be no doubt that sunlight plays an important part in the oxidation of food within the system, and this is probably one reason why night air is generally supposed to be injurious to delicate constitutions.

This heat, which is generated within the body by the oxidation of food and by muscular movement, would be lost by radiation if the temperature of the

atmosphere surrounding the body was far below the normal temperature of the system, and, therefore, this loss must be minimized by interposing between the integuments of the body and the air non-conductors of heat, in the shape of clothing, not to keep the cold out, but to keep the heat in. The face, part of the neck, and the hands are, however, generally exposed, and thereby the epidermis becomes hard and horny, thus becoming a bad conductor of heat, and very little of the systemic warmth is lost by radiation from these parts.

The hygrometric condition of the atmosphere, irrespective of temperature, has a great deal to do with the temperature of the body, at least as far as individual sensation is concerned. We feel more chilly in a cold, damp atmosphere than in a dry one of the same temperature, and we can endure a greater amount of heat when the air is dry than when it is filled with aqueous vapor. As far as I know, this fact has not, as yet, been satisfactorily explained, and I would suggest, as a reason, that the moisture is absorbed by the skin, thus making it a better conductor of heat and facilitating the ingress and egress of heat through it.

We also minimize the expenditure of animal heat by living the greater part of our time (in cities, at least) in houses and apartments from which the outer air is excluded as much as possible, and the atmosphere of which, during the cold season, is artificially heated.

The maintenance of the normal temperature of the body, therefore, depends upon the production of heat by oxidation of food within the system, by

muscular exercise, and upon the prevention, or at least reduction, of the radiation; and a lowering of this temperature, especially if it be sudden, causes contraction of the capillaries in the outer integuments, a disturbance of the heart's action, and a congestion of some of the internal organs, and particularly of the mucous membrane of the respiratory tract.

Taking it for granted that at a given moment there is a certain quantity of blood in the body which is distributed throughout the vascular system, a greater amount of blood than is normal will accumulate in some portion of the system when a contraction of the capillaries in an area of the surface takes place. Such an accumulation causes an over-distention of the capillaries, and consequently a congestion of the part. As examples of this may be cited the facts that deep-seated inflammations, or congestions, are relieved by counter-irritation of the skin, and it is by no means necessary to apply the counter-irritant directly over the organ affected to obtain the desired result; and also, that frequently inflammation, and even ulceration, of the bowels is a result of extensive burns and scalds of the skin of the chest or abdomen. In this latter case the capillaries of the skin are violently contracted and the blood driven to other parts of the body, and especially to the intestines, causing a congestion, followed by inflammation of their mucous membrane.

In connection with, and perhaps caused by, this contraction of the capillaries of the skin by cold there is always an irritation of the distal nerve ends, which, by reflex action, produces a change of the

heart's action, which in turn becomes a factor in the production of the congestion in other portions of the body.

The blush of shame is produced by reflex nervous action, the cause of which, however, is central and not peripheral, and not unfrequently congestion of the lungs is produced by violent or long-continued emotional disturbances. The reason why the mucous membrane of the respiratory tract is more liable to be the seat of this congestion than any other portion of the body, must be looked for in the fact that it, among civilized nations, is hardly ever free from irritation in one or the other portion of its extent. We constantly inhale particles of vegetable and mineral substances in the shape of dust, which, by engaging the cilia of the epithelium, act as irritants. This, together with the impure air surcharged with carbonic acid which we breathe in the confined atmosphere of our dwellings and public halls, produces a want of tone in the mucous membrane of the respiratory tract and its capillaries, thus predisposing it to congestion. For, as all fluids, so will the blood in the body when pressed upon at any particular point, seek an outlet at the point of least resistance—in this instance, the capillaries of the mucous membrane of the nose, pharynx, trachea, and lungs. Catching cold may then be defined as a momentary lowering of the temperature of the body by external influences, which causes both directly and indirectly an uneven distribution of the blood and thereby a congestion or inflammation of internal organs.

Here the question may be raised: Why is it that

some persons are more liable to catch cold than others, who, perhaps, are more exposed to cold and the inclemency of the weather?

In order to answer this question I must state that the power of producing heat in the system may be weakened by a number of causes, and that when thus weakened it is not able to produce an extra amount of heat when demand for it is made by exposure to a lower temperature. Thus we find that a person who leads a sedentary life and confines himself in an atmosphere artificially heated to from 75° to 80° Fahr., accustoms his system to habitually produce little heat, because little demand is made for it; or one whose digestive apparatus is out of order will not properly digest his food, and cannot, therefore, produce sufficient heat by oxidation of the food; or one who is deprived, voluntarily or involuntarily, of the necessary amount of oxygen, be it by being confined in close rooms or on account of disease of the lungs; or finally one who does not take exercise, and so does not produce heat by muscular motion, will easily take cold from the slightest exposure. While on the other hand, a person who lives an out-of-door life, and thus exercises his heat-producing faculty, takes cold but rarely, even when much exposed.

To prevent taking cold, therefore, a person should take outdoor exercise at all seasons and in all kinds of weather, should not dress too warmly, should have plenty of fresh air in his house and especially in his bedrooms, and should not heat the air in his rooms above 68 or 70° Fahr.

Pathology of the Mucous Membrane.—This subject, if entered into exhaustively, would carry us far beyond the limits of a hand-book such as this, and I will therefore confine myself to a few generalities, referring the reader to text-books on pathology, and to the chapters on the different diseases of the upper air-passages in this volume, for a more detailed account of the morbid changes met with in the mucous membrane of the throat, nose, and naso-pharynx.

The mucous membrane lining the throat and nasal cavities is exceedingly liable to diseases of an inflammatory character, which exhibit the same phenomena that are noticed in other parts of the body. Such inflammations, accompanied by pain, redness, and swelling, are sometimes *traumatic*, as when caused by the introduction of foreign bodies, the swallowing of corrosive substances, and the inhalation of irritating vapors; or they are *idiopathic* inflammations. Diseases of the throat and nose may also be results or symptoms of a systemic affection, such as tuberculosis, syphilis, cancer, scarlatina, etc. Finally, they may be of a nervous character, such as the various stages of paralysis of the different parts, and the laryngeal symptoms of hysteria. Then, again, we find the products and consequences of chronic inflammation in the throat as we do in other parts of the body, such as glandular enlargement, catarrhal ulcerations, and neoplasms, in different shapes and locations.

In most diseases of the larynx, pharynx, and nose the secretions from the mucous membrane are altered in quantity and character. They are either

increased or decreased in quantity, and either flood the parts or leave them unnaturally dry.

The natural secretion of the mucous membrane being a watery exudation, keeping the parts moist without being visible as a substance, may in disease become thick and slimy, running together in semi-transparent drops, to be collected into larger accumulations and expectorated as mucus. This thickening of the secretions is believed to be due to the admixture of new and old epithelial cells which have undergone a retrograde metamorphosis instead of covering the mucous membrane. Thus the lining of the larynx, pharynx, and nose becomes in places denuded of its epithelial covering; such places are called *abrasions*. They are seen to be of a darker color than the surrounding mucous membrane, and appear slightly depressed below the general surface. Such an abrasion will in time develop into an *ulcer* covered with pus, and presenting a whitish appearance, depressed in the centre and showing raised edges.

From this description it will be seen that a simple inflammation may develop shallow ulcers which are *catarrhal* in their character, and are *not* necessarily due exclusively to a specific disease of the general system, such as syphilis or tuberculosis, as is taught in most text-books.

THERAPEUTICS.

All remedies employed for the cure of affections of the upper air-passages should act first by protecting the parts from the influence of the air, and

secondly by stimulating the mucous membrane and its secreting glands to a healthy action. Among these remedies, nitrate of silver stands in the first place as a stimulant and protecting agent. In the latter capacity it acts first by coagulating the albumen contained in the secretions, and secondly by being partly converted into insoluble salts of silver, the chloride, albuminate, and mucinate, by combining with the chloride of sodium, the albumen, and the mucine of the secretion. In order to obtain the stimulating effect of this remedy, it is necessary to make the solution strong enough to have a surplus of nitrate of silver, which is not immediately converted into a chloride, used in the formation of an albuminate, or mucinate of silver.

Almost all the astringents, such as sulphate of copper, sulphate of zinc, tannic acid, alum, and others, are used with advantage both in solutions applied with the brush or sponge, or by means of the atomizer, and in the form of powder blown into the larynx by means of the insufflator. They all act more or less as stimulants to the mucous membrane. The vapors of ethereal oils inhaled from the vapor-inhalers, such as are contained in tar, cubebs, tolu, benzoic acid, carbolic acid, benzole, etc., are employed for the same purposes.

Alteratives acting upon the secretions of the mucous membrane, and in absorbing swellings, are given internally to aid the topical applications, and are also locally applied.

Modes of Administering Remedies.—Nitrate of silver in solution is applied to the ulcers, abrasions, or centres of inflammation, by means of a soft camel's-

hair brush, mounted on a stiff bent wire, held in a mirror-handle, or by means of a small piece of sponge or tuft of cotton held in the sponge-holder or applicator. It should never be applied all over the mucous membrane, as is done by the old-fashioned probang. Solutions of not less than forty grains to the ounce should be employed, and frequently the strength can with advantage be increased to sixty, eighty, and even one hundred and twenty grains to the ounce of water, or water and glycerine. Glycerine alone should never be used as a solvent for the silver salt, as its great affinity for water leaves the mucous membrane unpleasantly dry, and causes a severe burning pain in many persons.

As has already been stated, this drug is a powerful stimulant to the mucous membrane. But besides being this, it acts also as a local anæsthetic and an astringent, and should therefore be used with great discretion. It is beneficial when used in the first stages of an acute inflammation, as, for instance, in tonsillitis, where it allays the pain by its anæsthetic action, contracts the capillaries by its astringent action, and protects the surface of the mucous membrane by the formation of a film of albuminate, mucinate, and chloride of silver. Its stimulating action comes into play in the atrophic conditions of the mucous membrane and its glands. In the subacute and chronic inflammations attended with hypertrophic conditions of the glandular and submucous tissue, nitrate of silver is harmful.

Solutions of this salt under no circumstances act as an escharotic or caustic; that is, it does not devitalize the cells composing the tissue with which it

comes in contact, which statement can readily be substantiated by microscopical observations. The formation of the flakes of albuminate, mucinate, and chloride of silver, being mistaken for sloughs, has given rise to the misconception that solutions of nitrate of silver act as a caustic.

Nitrate of silver in the solid form is applicable only to deep specific ulcerations, and for the corrosion of neoplasms too small for operative interference, or for cauterizing the wound after extraction of a neoplasm, with a view to prevent its return. It is best used by fusing a small piece to the roughened end of a bent silver probe mounted in a mirror-handle. After use, the lunar caustic coating should be remelted by holding the end of the probe over the lamp, so as to destroy all infectious material clinging to it.

Nitrate of silver is also often advantageously used as an inhalation from the atomizer, either the steam or hand apparatus. When so used, the solution should not be stronger than ten grains to the ounce of equal parts of glycerine and water.

Iodine dissolved in glycerine, locally applied, is an admirable remedy in the hypertrophic conditions of the upper pharynx and nasal cavities, acting as an alterative and promoting absorption of the hypertrophied tissue. It is, however, not applicable to the larynx, as it often produces violent spasms of the glottis.

Iodoform acting like iodine as an alterative, has the advantage of being a local anæsthetic, but it also has the great disadvantage of its peculiar, penetrating, and lasting odor, which is very difficult to disguise or prevent. I have, however, found that

vaniline, in the proportion of ten grains to ʒj of iodoform, will to a very great extent, if not entirely, disguise the odor of the drug. It may be used in the form of a fine powder with the insufflator, and is especially applicable for dusting the ulcerations in syphilis and phthisis; or it may be dissolved in ether and used with the spray, the ether heightening the anæsthetic effect of the drug.

The other astringents enumerated may be applied in the form of powder, mixed with sugar of milk in various proportions, by means of the insufflator. When so used, they should be rubbed down to an impalpable powder and kept dry. Large particles of the remedies, if introduced into the throat, act as foreign bodies, and produce more irritation than is desirable. Or they may be applied in solution by the brush, sponge, or atomizer.

Volatile substances are best used for inhalation from the vapor-inhalers.

The touching of ulcers or abrasions in the cavity of the larynx or posterior nares is rather a difficult operation. It requires considerable practice for its successful performance, and is to be done in the following way.

After the mirror has been introduced by one hand, the patient himself holding his tongue with his fingers protected by a napkin, and the image of the larynx is in full view, the sponge or brush is introduced with the other hand into the mouth of the patient, until its point nearly touches the image of the ulcer or abrasion in the mirror. The hand is then elevated, thereby carrying the brush downward, but always keeping the image of the ulcer

and that of the sponge or brush in a line until the desired spot is reached. After touching the ulcer once or twice lightly, the brush or sponge must be quickly withdrawn, without coming in contact with either the posterior wall of the pharynx or the epiglottis and tongue. If a slight spasm of choking follows, it is easily counteracted by the patient swallowing a draught of cold water.

These local remedies, in the form of powder, may often with advantage be combined with each other, or substances may be added to them for the purpose of dilution, or to prevent their being washed away by the secretions, immediately after they have been applied. So, for instance, may iodoform be combined with morphia and gum acacia, with a view to lessen pain by the morphia, and to cause the powder to remain longer in contact with the surface by the gum acacia, which, forming a paste with the secretions, cannot easily be dislodged. Solutions used in the spray can also be combined, and the practitioner must use his judgment in selecting the proper combinations.

Local applications should never be made without having first thoroughly cleansed the mucous membrane. This is best done by an alkaline solution, thrown into the cavities by means of the spray. An excellent solution for this purpose is Dobell's solution, composed of

℞.—Sodæ bibor.
Sodæ bicarb. āā ʒj.
Acid. carbol. gr. xxx.
Glycerinæ, fl ʒj.
Aquæ font. Oij.—M.

which is not only cleansing, but produces a pleasant sensation in the nasal and laryngeal cavities. If the secretions have become inspissated, as is frequently the case in the nasal cavities, the crusts should first be softened with the alkaline solution, and then removed by a copious stream of salt and water from the anterior or posterior nasal douche, or, if still adherent, should be loosened by instrumental interference.

Remedies are also frequently used in the form of lozenges; that is, they are combined with a fruit paste, generally currant paste, which is pressed into small round or oval cakes. These lozenges are to be slowly dissolved in the mouth, thus impregnating the saliva with the medicine. By swallowing this saliva, it comes in contact with the posterior wall of the pharynx and also enters the larynx, acting upon the mucous membrane.

Among the alteratives which taken internally act more especially upon the mucous membrane of the larynx, pharynx, and upon the Schneiderian membrane, are iodide of potassium, bromide of potassium, calomel, cubebs in the form of the resin, oil, or the cold fluid extract, crude petroleum, and other substances which might be named. The iodide, bromide, and calomel should be given in small doses, and I have found that a combination of the former two is preferable, and can be borne much longer by the patient than either alone.

Acute as well as chronic inflammations of the larynx and naso-pharynx are greatly influenced by counter-irritation, such as is used in deep-seated inflammations in other parts of the body. Among

them may be named external application of iodine, mustard, croton oil, and fly blisters. In some severe cases, especially of œdema of the glottis and epiglottis, leeches applied to the neck are recommended by high authorities, and are often of the greatest advantage in promptly relieving the tension of the parts, and consequent stenosis of the larynx.

Inhalations of ether, chloroform, nitrite of amyl, and other powerful sedatives are employed in nervous affections of the larynx. In chronic tonsillitis local applications of tr. iodinii, tr. ferri chlor., concentrated solution of tannic acid, and solid nitrate of silver are used, but with doubtful results. Lately the injection of iodine solution into the substance of the tonsil has been recommended, but my experience shows that very little if anything is gained in this way.

Many other remedial agents are employed by a variety of methods in treating diseases of the throat; they will suggest themselves to the intelligent observer in special cases.

CHAPTER VI.

ACUTE LARYNGITIS.

THE affections of the throat are divided into two distinct classes, which are distinguished by location and anatomical relation of the parts affected. Thus we must consider the diseases of the larynx proper under one head, while the affections of the pharynx,

anterior nasal cavities, and the naso-pharynx are to be considered under another. The different members of these two classes, however, intermingle with each other very frequently, and it often becomes difficult to determine to which of the two divisions an affection belongs. But this difficulty is purely theoretical, and does not in the least affect the treatment or prognosis.

For instance, a chronic laryngitis is almost always associated with a chronic pharyngitis, and only by careful examination into the history of the affection can we determine whether to call it a laryngitis or a pharyngitis. To elude this difficulty, some authors have adopted compound names, such as laryngo-pharyngitis, or pharyngo-laryngitis, but these appellations have not been generally accepted, and I shall therefore not use them in this volume.

By far the most common of all throat diseases which come under our notice is the acute laryngitis so frequently occurring in childhood and early adult life. It consists in a more or less extended inflammation of the mucous membrane lining the larynx, attended by heat, pain, and swelling, and by general febrile symptoms, such as acceleration of the pulse, increase of bodily temperature, dryness of the skin, loss of appetite, etc.

Varieties.—Two varieties of this affection are recognized, which differ from each other more in the severity of the symptoms than in the causation. These are the ordinary mild acute laryngitis, and the grave acute laryngitis, sometimes called œdematous laryngitis, because œdema is a frequent complication.

Cause.—This affection may be of traumatic origin, or may be purely idiopathic.

If *traumatic*, it may be caused by the presence of a foreign body in the larynx, such as a fish-bone, pin, button, etc., swallowed, or rather inhaled accidentally, or by the swallowing of corrosive substances accidentally, or with suicidal intent,[1] or by the inhalation of acrid vapors or dust. If *idiopathic*, it is caused by a sudden chilling of the mucous membrane, or is dependent upon and a symptom of a general disorder of the system, such as scarlatina, measles, diphtheria, etc., or, finally, it may be caused by external injuries to the neck.

Symptoms.—In traumatic acute laryngitis, the symptoms show themselves immediately after the introduction of the irritating substance, and last for some time after the removal of the foreign body, if such be the cause, or, in the case of corrosive substances having been swallowed, until the destruction of tissue has been arrested, and the process of repair is completed.

In idiopathic acute laryngitis, on the other hand, the symptoms are not developed until some time after the exciting cause has made its impression.

The symptoms in both varieties of the disease are pain about the throat, a feeling of constriction, hoarseness sometimes amounting to aphonia, diffi-

[1] Primary acute laryngitis is, however, but rarely the result of intentionally swallowing corrosive substances, because the suicide expects to be burned by the liquid, and swallows it quickly; while the person swallowing a corrosive substance accidentally is surprised or startled, and takes an inspiration, thus introducing some of the fluid into the larynx.

cult and painful deglutition, dry and hard cough. Respiration is, however, not usually affected. Later on the cough becomes loose and expectoration appears, which is at first of a yellowish-green color and very thick, becoming gradually more limpid and lighter in color. On laryngoscopic examination we find the mucous membrane of a uniform intense red, and somewhat swollen. The pillars and tonsils, as well as the uvula and soft palate, participate in the general hyperæmia.

The epiglottis is generally erect and thickened, and the ventricular bands are so swollen as to sometimes obscure the view of the vocal cords.

The vocal cords are reddened, but are generally of a lighter color than the mucous membrane in their vicinity, so that they can be distinguished from the ventricular bands. The arytenoid cartilages are red and swollen, and appear like balls.

In the graver and more rare form of acute laryngitis these symptoms appear very rapidly, and the swelling of the mucous membrane becomes so great by œdematous infiltration, especially on the epiglottis, ventricular bands, or walls of the *sub-glottic* cavity, as to interfere with respiration, and give rise to very grave symptoms of asphyxia, which may result in death if not speedily removed.

Duration.—The duration of idiopathic acute laryngitis is usually a week or ten days from the first appearance of the symptoms to perfect restoration of health in the parts, but it may frequently be cut short by active treatment, or may extend over two weeks in debilitated subjects. The duration of traumatic acute laryngitis cannot be determined, as it

depends upon the extent and severity of the injury received.

Treatment.—The ordinary slight form of acute laryngitis without the complication of œdema readily yields to the topical application of astringents by means of the atomizer. Of these, a ten-grain solution of alum, to which is added a drop of the dilute carbolic acid, is perhaps the most satisfactory in its results.

Hot vapor inhalations of tincture of benzoin or balsam of tolu afford relief by loosening the cough.

Internally, saline purgatives, and a combination of iron, chlorate of potassa, and bromide of potassium, should be given. This latter I am in the habit of prescribing in a form such as this:

℞.—Tr. ferri chlor. fℨij.
Potass. chlor. ℨij.
Potass. brom. ℨiij.
Ext. glycyrrh. ℨj.
Aquæ dest. q. s. fℨvj.

Sig. A dessertspoonful in water every 3 or 4 hours. Gargle and swallow.

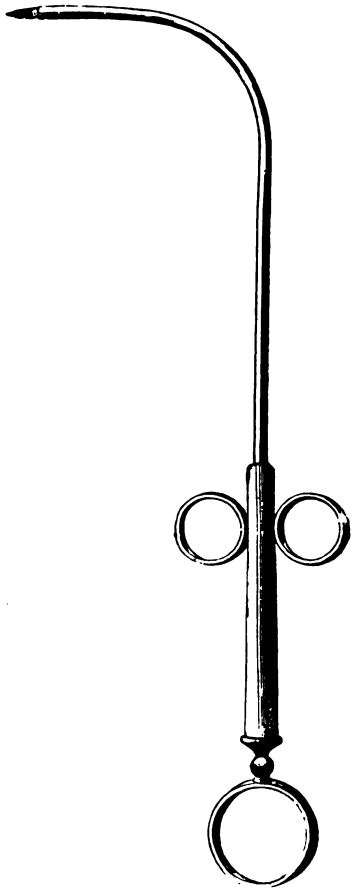
Or in the form of lozenges, which are more easily taken by children, and are fully as effective, if not more so than the liquid mixture. The following is the formula:

℞.—Potass. chlor.
Potass. bromid.
Pulv. ext. glycyrrhizæ, āā gr. iij.
Tinct. ferri chlor. ♏ 1½.
Sugar etc., q. s. to make one lozenge.

It has the effect of allaying the irritability of the mucous membrane, and especially of reducing the

swelling of the palate and epiglottis, thus diminishing the dysphagia.

FIG. 39.



Tobolt's concealed laryngeal lancet.

Counter-irritation, by means of iodine or mustard applied to the skin over the larynx, should always

be resorted to, and very often alone leads to a speedy termination of the affection.

In the graver form, complicated by œdema of the larynx or with consequent stenosis and embarrassment of respiration, there is, as a general rule, no time to wait for the slow action of saline purgatives, counter-irritation, leeches applied to the neck, or venesection, to prevent death from suffocation. A more speedy and efficient method of disgorging the parts of their blood and serous exudation has to be resorted to. This consists in freely scarifying the mucous membrane by means of a small knife-blade attached to a curved handle and guided by the laryngeal mirror (Fig. 39). A more detailed description of this instrument will be found further on.

By this means the alarming symptoms of suffocation are arrested, and time is gained for the action of astringents, counter-irritation, etc., to effect resolution. If, however, circumstances will not permit of this method being employed, tracheotomy should be at once resorted to, so as to insure perfect oxygenation of the blood. If left until everything else has failed, and the toxic effects of carbonic acid in the blood have progressed too far, a sudden and even complete oxygenation of the blood will not restore the normal condition, and the patient will succumb to the poison and will be asphyxiated with his lungs full of fresh air.

Ulcers are rarely if ever formed in acute idiopathic laryngitis, while suppuration and the formation of abscesses are often met with. The latter are treated as if situated on the surface of the body. In opening them the knife, which should be a guarded one, is guided by the laryngeal mirror.

Should the inflammation be confined to the mucous membrane of limited parts of the larynx, the affection is designated as *epiglottidis* if the epiglottis is the seat of the inflammation, "*corditis vocalis*" if the vocal cords are affected, and so on.

Œdema of the Larynx.

As has already been mentioned, it happens sometimes that a serous effusion is thrown out into the submucous tissue of the larynx, thus causing a very great swelling of the parts affected. It may occur independently of any disease of the larynx; or as a sequel or complication in systemic diseases, such as smallpox, typhoid fever, scarlet fever, phthisis, and syphilis, and rarely in chronic nephritis; or as a complication of laryngitis, acute or chronic pharyngitis, acute or chronic tonsillitis, malignant disease of the tongue, epiglottis, etc.

The effusion, which may be of a bloody, serous, or purulent nature, is usually found in the submucous tissue of the ary-epiglottic folds, at their inner surface, swelling them and the ventricular bands until they touch each other. Next in frequency it is observed in the epiglottis, then in the vocal cords themselves, and rarely in the mucous membrane lining the subglottic cavity.

The symptoms of swelling and stenosis generally appear very rapidly, and if the progress of the effusion is not promptly arrested by scarification of the parts, or the lungs not supplied with fresh air by an external opening in the trachea, a fatal issue of the disease speedily sets in.

Œdema of the larynx or parts of the larynx occurs most frequently in middle-aged persons, although it has been observed in new-born children and in extreme old age. Patients suffering from phthisis or syphilis are more frequently affected; one attack is often followed by another, so much so that Dr. Fauvel, of Paris, is in the habit of supplying patients who have had one attack of œdema of the larynx with tracheotomy instruments, so that in case of an emergency they may be at hand. In many cases, however, the swelling does not completely close the opening of the larynx and trachea, even at the height of the affection, and consequently the dangerous symptoms are less marked. The patient generally complains of a feeling of oppression, pain, and fulness of the throat; and frequently a *barking* cough of a peculiar character is observed—probably due to the swollen parts acting like foreign bodies, and causing the irritation and excitation to cough. If the epiglottis or ary-epiglottic folds are the seat of the swelling, extreme dysphagia is often experienced by the patient.

On examination with the laryngoscope the mucous membrane is usually hyperæmic, and of a uniform red, which is increased to scarlet or even purple over the swollen parts. These are always more or less pear-shaped, because the serous effusion gravitates towards the interior of the larynx, and bulges the mucous membrane more below than above. If œdema complicates other throat affections, the characteristics of these will be seen beside the œdematous swellings.

Treatment.—The treatment must be directed to the speedy absorption or evacuation of the serous effusion by scarification in severe cases, as has already been described under the head of acute laryngitis, and by counter-irritation, bleeding, and local astringent applications. Among the counter-irritants, mustard plasters and fly-blisters act more promptly than iodine and croton oil when applied to the neck. Bleeding should be accomplished by leeches or cupping, and the general health should be taken into consideration in regard to the amount of blood to be taken. The astringents should be in the form of finely nebulized solutions introduced into the larynx by means of the atomizer, and among them a strong solution (fifteen to twenty grains to the ounce) of alum acts in most cases with great promptness in reducing the swelling; but solutions of tannic acid, chlorate of potash, iron, and others may be used in the same manner with very good results. Nitrate of silver or other caustic applications should not be used, as the spasm following their introduction into the larynx, which under ordinary circumstances is very slight when only a small ulcer or abrasion is to be touched, becomes severe when a larger surface has to be brushed over. The blood already not being fully aërated because of the obstruction to respiration, if suddenly deprived of a fresh supply of oxygen, even for a few seconds only, becomes surcharged with carbonic acid. A reaction is prevented, and the patient is asphyxiated.

Subacute Laryngitis.

When an acute inflammation of the larynx is subsiding, or when the inflammatory action of the mucous membrane has been from the beginning but slight, we notice what is termed a *subacute laryngitis*, which exhibits the following symptoms:

Symptoms.—The patient complains of little or no pain, slight dysphagia, little cough, more marked in the mornings, with a yellow tenacious expectoration, and slight hoarseness of the voice. On laryngoscopic examination the mucous membrane is seen to be redder than normal, with here and there spots of a deeper red; the vessels appear injected, and can be traced for a considerable distance, especially on the free margin and glossal surface of the epiglottis. The pharynx and velum palati are almost always implicated in the general hyperæmia.

Treatment.—This stage of inflammation usually disappears in a few days under the treatment which has been adopted for the acute form, and recovery is frequently hastened very much by topical applications, by means of the brush, of solutions of sulphate of copper, sulphate of zinc, and especially nitrate of silver, to the brighter spots.

Diet.—In all cases of acute and subacute inflammations of the larynx, and especially when dysphagia is present, soft food, such as gruels, mush, milk, and beef-tea, and cold drinks should be given. With children, iced milk sweetened with a little sugar is often the only food which can be taken. When the difficulty of swallowing is very great, liquids can

often be taken more easily through a glass tube or straw, and soft food can be swallowed by the patient bending the upper part of the body and the head forward.

CHAPTER VII.

CHRONIC LARYNGITIS.

Simple Chronic Laryngitis.

In some cases, especially when the system is below par, and when the acute stage, being very mild, has not been treated, the acute and subacute laryngitis will pass into the chronic stage of inflammation. In phthisis, tuberculosis, cancerous disease, and during the convalescence from continued fevers, when the system is so low as not to react by an acute inflammation, we observe a subacute and then chronic form of the disease. As chronic laryngitis is due to a variety of causes, and as there are slight differences in the symptoms and laryngoscopic appearances of the disease excited by these causes, several forms of chronic laryngitis must be recognized, and these will be treated of under different heads.

Symptoms.—The symptoms of simple chronic laryngitis resemble those of the subacute form of inflammation in many points. The patient complains of a sense of constriction of the throat, but of no difficulty of deglutition, a feeling of dryness of the mucous membrane, and a dry and hacking

cough, with white stringy expectoration resembling boiled starch. The voice is usually hoarse, faltering, and easily fatigued, while there exists no embarrassment to respiration. On laryngoscopic examination, we find the mucous membrane to be in a state of hyperæmia with spots of heightened color, the vessels injected, the glands enlarged, and abrasions frequently in the inter-arytenoid space.

This form following acute laryngitis, and caused by a want of tone in the system, is looked upon by some writers as very rare. Its peculiarity consists in the fact that true ulcerations are very rarely found, but that abrasions are frequent.

Another very frequent cause of simple chronic laryngitis is the so-called mouth breathing, produced by nasal obstruction; for it is a well-established fact, that the air as it passes through the tortuous nasal chambers is raised two degrees in temperature, is filtered of its dust, and is saturated with moisture by the secretion of the serous glands, embedded in the nasal mucous membrane. If now, the nasal passages are obstructed, no matter from what cause, this dry, cold, and dust-laden air directly impinges upon the mucous membrane of the larynx, and, continually irritating it, causes a chronic inflammation.

Treatment.—The treatment to be adopted in this form of chronic laryngitis, should be stimulation of the mucous membrane by vapor inhalations of tolu, or of tincture of benzoin, or by astringents in solution introduced by means of the atomizer. The most important feature, however, is the topical application of a forty to sixty grain solution of nitrate of silver to the abrasions. These applica-

tions should be made to the sores only, by means of a piece of sponge held in the sponge-holder, or better with the brush, and should be repeated every other day if possible, so as to keep the raw surfaces covered, and allow the new cells to form under the artificial scab.

The application should not be made with the cotton-applicator, as there is danger of a small thread becoming detached and giving rise to irritation and consequent often distressing cough.

In this form of laryngeal disease, lozenges are frequently the best form in which to exhibit such remedies as are intended to act both locally and by absorption, for it has been proved beyond a doubt, that a portion of the saliva, as well as the secretion from the mucous membrane of the pharynx, finds its way into the larynx, and especially comes in contact with the mucous membrane covering the inter-arytenoid space. Therefore, if we impregnate the saliva with some mild astringent substance, we will obtain a direct local action upon the laryngeal mucous membrane, which, being long continued by the slowly dissolving lozenge, is very beneficial.

The persistent and often spasmodic cough being the most distressing symptom, we must direct our attention to its alleviation. This laryngeal cough is always due to irritation of the laryngeal mucous membrane, and especially of the mucous membrane lining the inter-arytenoid space, and not to congestion of the bronchial or tracheal mucous membrane. Expectorants and cough mixtures will therefore not be as serviceable as topical applications. The laryngeal irritation, however, often produces what

might be termed a reflex irritation, lower down in the respiratory tract, and, if such be the case, anodyne expectorants will be found of great service. Under no circumstances, however, should syrups be used, as they invariably derange the digestive system and thereby interfere with proper nutrition of the system at large.

Tonics, and especially iron, are of great service in building up the system, thus aiding in the restoration of health to the mucous membrane of the larynx. A faradic current of electricity applied externally, the poles being placed one on either side of the neck, acts as a local tonic, and is of great benefit.

As a summer resort for such cases, the sea-shore should be avoided, as the dampness of the atmosphere is very apt to increase the swelling of the mucous membrane; in fact, we can observe always an increase in the symptoms during easterly winds even when the patient remains in the house. Plenty of fresh air and especially mountain air, on the other hand, is of the greatest benefit, and will, together with good nourishing food, often alone be sufficient to remove all trouble in the throat.

Laryngitis Phthisica.

Another form of chronic laryngitis is found in phthisis and tuberculosis, and as it presents some peculiarities it may be considered under a separate head.

Symptoms.—In laryngitis phthisica or tubercular laryngitis we find that the respiration is always more

or less hurried, and becomes embarrassed in the later stages. The patient complains principally of a dry, hacking, and painful cough, which later becomes looser and more frequent, accompanied with copious expectoration of greenish or yellowish phlegm. Swallowing is difficult in the earlier stages, and subsequently becomes painful. Whenever there is extensive ulceration of the epiglottis or ary-epiglottic folds, the pain in deglutition is felt as a sharp, lancinating pain in the ear on that side most affected in the larynx. This pain is considered by some authors as pathognomonic of cancerous disease of the larynx, but I have found it to be very common in cases of tubercular or syphilitic ulcerations, and it is a source of great suffering to the patient. The voice is always more or less hoarse and of a peculiar character, and aphonia usually sets in afterwards. On laryngoscopic examination we find the mucous membrane in a state of hyperæmia, which culminates in certain places to form shallow ulcers, especially in the inter-arytenoid space. The color of the mucous membrane throughout is of a peculiar ashy-red, very difficult to describe, but never to be forgotten when once seen. The epiglottis is usually thickened, and often presents abrasions or shallow ulcers on its free margin. The ventricular bands and the vocal cords are more or less swollen and reddened, causing the peculiar character of the voice which we notice in patients suffering from phthisis.

The most characteristic peculiarity of laryngitis phthisica is an abnormal pyriform swelling of the arytenoid cartilages; this is frequently seen in the

laryngeal mirror before a physical examination reveals lung implication. The arytenoid cartilages appear very large and rounded at their inner surfaces, tapering gradually toward the side of the larynx until they are lost in the ary-epiglottic fold, their apices entirely disappearing. Often only one of the cartilages is thus tumefied, and it is then generally found that the lung on the same side is affected, while the other lung is still healthy. Occasionally we find cases in which the reverse is true. Less frequently we find a *turban*-like swelling of the crest of the epiglottis, which at the same time assumes a horseshoe bend. These two conditions have been observed to stand in a certain relation to the disease of the lungs, so that in the cases where we observe the pyriform swelling of the arytenoid cartilages, the lung tissue has not as yet begun to break down, but as soon as the breaking down takes place in the lung the epiglottis begins to be affected. In the literature of the subject I find that but few authors make mention of these facts, while others either do not refer to them at all or merely hint at them by speaking of the phthisical œdema of the larynx.

In the laryngeal mirror these swellings do not give to the observer the impression of simple œdematous tumefaction, and free scarification of the parts does not relieve the symptoms—aphonia and dysphagia—caused by them.

Microscopical examination of a number of larynxes showing these swellings reveals the fact that the loose submucous tissue is largely infiltrated by a small-celled infiltration, with a tendency to the formation

of depôts with cheesy centres, and, what is rather remarkable, hypertrophy of the glands and follicles, so as to amount almost to an adenomatous growth. There is also a certain amount of serous infiltration into the network of the submucous tissue, which only tends to increase the swelling.

In the advanced stages of tuberculosis we find tubercular deposits in the mucous membrane of the larynx, appearing as numerous small round elevations similar to the enlarged follicles which we observe in follicular pharyngitis. The swelling and ulceration of the epiglottis and inter-arytenoid space cause painful deglutition, and, the irritation being transmitted to the salivary glands, an increased flow of saliva is observed. The ulceration in the inter-arytenoid space, as well as on the vocal cords themselves, often causes painful phonation, and the patient frequently complains of the air inhaled feeling hot, which sensation is due to the irritating action of the air on the raw surfaces.

Treatment.—The treatment of this throat affection consists, besides the administration of tonics, cod-liver oil, and alcoholic stimulants, mainly in reducing the irritability of the larynx by painting the ulcerated surfaces with strong solutions of nitrate of silver (60 to 120 grains to the ounce), covering them with iodoform and tannin with the insufflator, spraying the larynx with a saturated solution of iodoform in ether, etc., and in stimulating vapor-inhalations. The bromide salts, and especially the bromide of sodium and ammonium in five- or ten-grain doses given internally, have a very good effect in loosening the cough and in reducing the

tenacity of the expectoration. Moderate daily exercise in the open air is of course essential in staying the progress of the disease of the larynx as well as of the lungs. Inasmuch as the laryngeal symptoms are dependent upon the lung affection, the prognosis is, of course, very unfavorable, but by proper treatment the patient can be made very comfortable as regards the laryngeal implication.

Syphilitic Laryngitis.

Secondary and tertiary syphilis show themselves very frequently in the mucous membrane of the larynx, pharynx, and mouth, and are one of the most common causes of chronic laryngitis.

Symptoms.—The afflicted patient usually complains of a slight hacking cough, hoarseness, and sometimes of difficult and painful deglutition. On laryngoscopic examination, the mucous membrane is found to be hyperæmic and swollen, with patches of a brick-red color, symmetrical in shape and distribution on both sides of the larynx. Two kinds of ulcerations are noticed in syphilitic laryngitis, the shallow and the deep. The shallow ulcer, which usually appears very suddenly, is surrounded by an areola of deep-red color, has slightly raised edges, and is covered by a yellowish creamy pus, which, however, is not very tenacious, and is easily washed away by a spray, exposing a raw but seldom bleeding surface. It may be of almost any shape, but is most commonly oval in outline. The deep ulcer, on the other hand, appears slowly and gradually, and is not surrounded by a distinct areola. Its

edges are raised and often ragged, and its surface is covered by a thick, tenacious pus, which cannot be easily washed away. It is usually of a rounded outline, and contiguous sores have a tendency to run together so as to form large ulcers of an irregular outline. The deep ulcer has also a tendency to invade the deeper-seated structures, thereby producing the great loss of tissue we so frequently meet with in syphilitic disease of the upper air-passages. When the epiglottis is the seat of the deep ulcer its edge usually appears ragged, with points projecting from the surface. This peculiarity may be explained by the fact that the glands which perforate the cartilage are destroyed by the ulcerative process before the cartilage itself is attacked, thus leaving the partitions stand out above the surface of the ulcer. The shallow ulcers are the result of mucous patches, while the deep ulcers result from the breaking down of gummata in the mucous membrane.

The one great peculiarity of syphilitic ulcerations in the upper air-passages, and especially in the larynx, is their symmetrical distribution. Thus we find ulcerations of similar shape in the same position on either side of the larynx, occupying, for instance, the middle of each ventricular band, or, if we see an ulcer on one side only, we notice a focus of inflammation of similar shape in a like position on the other side, and what is true in regard to the symmetry of ulceration is also true of the distribution of foci of inflammation. Syphilomata are rarely seen in the larynx, while neoplasms of both benign and malignant nature are frequently met with in patients afflicted with syphilitic laryngitis.

The pharynx and soft palate always participate more or less in the general specific inflammation, and form a diagnostic sign warning the laryngoscopist *not* to use the instruments generally employed, but to use a mirror marked in some way as reserved for specific cases. This caution is of the greatest importance in private practice, as well as in dispensary or hospital work, for practical experience has proved that the disease in certain stages is readily communicated from one patient to another by infectious material clinging to the instruments, even after supposed thorough cleansing.

Signs of specific disease, which hardly ever fail, are two brick-red, narrow bands of inflammation running along the edge of the velum palati and stopping short equidistant from the root of the uvula, and a symmetrical distribution, in size, shape, and position, of brick-red patches of inflammation in the oral cavity.

Treatment.—The treatment of syphilitic laryngitis must consist in constitutional treatment with iodides and mercury, tonics, cod-liver oil, fresh air, etc., as is laid down in the text-books for any case of syphilis, and of appropriate local treatment. Some authors contend that the constitutional treatment alone is sufficient to arrest the progress of the ulceration and cure the inflammation, and that local applications are not only unnecessary but often give rise to great inconvenience to the patient. My experience has been, however, that local applications, not only hasten the cure and add to the comfort of the sufferer, but also in a great measure prevent the extensive destruction of tissue, and the subsequent, often disastrous, cica-

tricial contraction and deformity. I therefore look upon topical treatment as essential in these cases.

The shallow ulcers, the result of mucous patches, should be touched with solid nitrate of silver melted on the end of a silver probe, as described in Chapter IV., and, as a rule, will readily disappear under this treatment. Before touching them the pus should be removed from their surface with a spray, and, if necessary, with a sponge or brush, moistened with an alkaline solution containing carbolic acid, so as to expose a clean surface to the action of the caustic. It is well, especially for the beginner who is not sufficiently dexterous to prevent the silver from coming in contact with the non-ulcerated mucous membrane, to follow the application with a spray of a strong solution of salt, in order to convert the surplus of the nitrate into the inert chloride of silver.

The nitrate of silver is, however, not sufficient when we have to deal with deep ulcerations, and stronger caustics must be used to check their progress. Among the extended list of caustics, the most satisfactory in my experience are the galvano-cautery and a solution of the acid nitrate of mercury (one part to five of water), applied to the cleansed ulcerated surface. The galvano-cautery is to be used as a first application, making an eschar over the whole surface of the ulcer, and when this has been thrown off, the acid nitrate of mercury solution is to be applied with a sponge. After a time, when the process of repair is beginning to set in, this application becomes painful, and should then be omitted, and the ulcerated surface should be dusted over with a powder composed of iodoform

gr. xxx, tannin gr. x, and pulv. amyli gr. xx. Under such treatment I have seen extensive syphilitic ulcerations heal with little or no cicatricial contraction resulting.

Nitric acid, hydrochloric acid, chromic acid, and other caustics have all been recommended as applications to syphilitic ulcerations in the throat, but their action not being under perfect control, they cannot with safety be used; besides, they invariably give a great deal of pain to the patient.

It sometimes occurs that the perichondrium becoming affected, is detached from the cartilage, thus causing necrosis. If this occurs in the arytenoid cartilages they may become detached, and, by falling into the trachea, may give rise to dangerous irritation of the trachea. They should, therefore, be carefully watched, and removed with the laryngeal forceps before there is any chance of their becoming detached spontaneously. Besides the topical applications of caustics, the inhalation of carbolic acid solution from the atomizer, and the spraying of the larynx with some anodyne solution, when the pain is very great, is to be recommended.

The prognosis regarding the affection of the throat is rather favorable if the destruction of tissue has not gone too far; and patients in whom one of the vocal cords has been destroyed have been known to regain the voice. In such cases the ventricular band of the same side takes upon itself the action of the lost vocal cord, and meets the cord on the opposite side to form the rima glottidis and produce a vocal sound.

There are also cases on record in which the

greater part of the epiglottis has been eaten away by specific ulceration, and in which, after the ulcerated edge had healed, no difficulty of any account was experienced by the patient in deglutition.

Deep ulcerations of the larynx are also seen in the rarer diseases of lupus, elephantiasis, carcinoma, and perichondritis, and it is often very difficult to make a differential diagnosis, especially in lupus, between these affections and syphilis. Lupus but rarely occurs in the larynx primarily, and, if so, is soon followed by manifestations of the disease elsewhere. The ulcerations are not symmetrical, and the color of the mucous membrane is not of the brick-red hue seen in syphilis. The treatment is the same as recommended for lupoid ulcerations elsewhere. Elephantiasis of the larynx is so extremely rare in this country at least, that but very few cases have been recorded. The only case I have seen is a specimen in the possession of my friend Dr. Beecher, of Philadelphia, who kindly loaned it to me for examination. This disease never shows itself primarily in the larynx, and is only seen as a secondary manifestation when other parts of the body have been affected.

Carcinomatous ulceration due to the breaking down of cancerous infiltration of the tissues of the larynx, may readily be diagnosed by the aid of the microscope. Perichondritis, as a rule, is secondary to ulceration or inflammation due to any of the above diseases, and but rarely occurs idiopathically.

Traumatic Chronic Laryngitis.

The inhalation of acrid vapors or dust incidental to many occupations, as well as the accidental introduction into the larynx of foreign bodies which remain there for some time, will produce a chronic laryngitis, which, on account of the causes being purely external, may be termed traumatic chronic laryngitis.

Symptoms.—When acrid vapors or dust are the exciting cause, the patient complains of a burning sensation, together with great dryness and fulness of the larynx, which cause him to clear his throat continually. A slight hacking cough is usually present. The expectoration, which is very scanty, and resembles cooked starch in consistence, is either grayish-white or stained with dust, and is apt to fly out of the mouth with considerable force in the shape of small pellicles when the throat is cleared. Where foreign bodies embedded in the tissue of the larynx cause the affection, the sensation is that of a localized pain increased in the act of swallowing, together with a feeling of dryness and fulness of the throat.

On laryngoscopic examination we find the appearances noticeable in simple chronic laryngitis.

Treatment.—The treatment must, of course, be directed towards removing the cause of the trouble by extracting the foreign body if one be present, or by advising the patient to change his occupation, or, if that be not possible, by telling him to breathe through a moist sponge or respirator while working in an atmosphere filled with dust. If the vapors of

acids be the cause, the sponge should be frequently moistened with lime-water or a strong solution of sodium carbonate.

As in the other forms of chronic laryngitis, exercise in the fresh air, good nourishing food, and topical applications of nitrate of silver or astringents to the abrasions, as well as stimulating inhalations, should be employed to counteract the effects of the irritating causes of the affection, and to restore the mucous membrane to its normal condition.

As a preventive against acute as well as chronic laryngitis, the patient should be advised to bathe the throat morning and evening with *cold* water or cold salt and water, and not to wrap shawls and furs around the neck when going out into the open air. Nothing more predisposes persons to throat affections than this habit of keeping the neck warm. It interferes with the exhalation of the skin, and makes it tender.

Stenosis of the Larynx.

Stenosis of the larynx, or obstruction to the free ingress and egress of air through the larynx, is either temporary or permanent; that is, it may either be relieved by the curative power of nature, aided by internal or topical medication, or requires surgical interference for its cure.

Temporary stenosis is caused by swellings in the larynx of an inflammatory character, such as abscesses, or by serous or bloody effusion in the submucous cellular tissue, such as œdema, which has already been considered. Permanent stenosis is

produced by foreign bodies lodged in the larynx, by neoplasms, and by cicatricial contraction and adhesions following ulceration.

The treatment must consist in the removal of the foreign body or neoplasms, as described further on, while the cicatricial adhesions must be severed, if possible, with the galvano-cautery knife. It frequently happens that the vocal cords become agglutinated by the healing of linear ulcers, or after thyrotomy, thus producing stenosis of the glottis. They must then be cut apart, and kept so by constant motion during the healing process. If this is not possible, or if the stenosis exists in the subglottic cavity, dilatation with steel bougies must be resorted to. In all cases of stenosis, if the cause cannot be removed at once, tracheotomy should be performed as soon as possible to prevent carbonic acid poisoning of the blood.

CHAPTER VIII.

FUNCTIONAL DISORDERS OF THE LARYNX.

HAVING described the symptoms and treatment of inflammation of the mucous membrane lining the laryngeal cavity, we can now proceed to consider the functional disorders of the larynx either as the result of inflammatory processes or those independent of such causes.

APHONIA.

The most common of these functional affections is aphonia or loss of voice. It is due in the first place to an inability of the vocal cords to vibrate with sufficient rapidity to produce sonorous vibrations of the air, or to an inability of the vocal cords to vibrate in harmony with each other, thus producing an irregular motion of the air. In the first instance total loss of voice will be the result, in the latter hoarseness of the voice to a greater or less degree will be observed.

Causes.—This inability of the vocal cords to vibrate may be due to several causes:

1. To thickening or swelling of the cords in acute and chronic inflammations, and in œdema of the glottis, making them so heavy and inelastic that the current of air from the lungs cannot move them.

2. To the destruction of part or the whole of one or both vocal cords by corrosive agents accidentally introduced, or by extensive ulceration, the result of syphilis, cancer, or other ulcerative process.

3. To cicatrization of the cords following the operation for the removal of neoplasms, or the unsuccessful attempt at cutting the throat, or following the healing of linear ulcers, thus gluing the cords together.

4. To paralysis of the muscles of vocalization, either on one side only or on both sides, thus preventing the narrowing of the glottis to a slit, or causing a relaxation of the cords when approxi-

mated, so that the vibrations are too slow to be appreciated by the ear as a continuous sound.

5. To the presence of a neoplasm or foreign body which mechanically interferes with the sonorous vibrations of the cords.

Hoarseness or partial aphonia, being due to the same causes, exerting their influence in a less degree, may be considered together with total loss of voice.

The aphonia which is caused by swelling of the cords due to inflammatory infiltration, hyperplasia, and œdema, the cords becoming so thick and heavy that they cannot vibrate with sufficient rapidity to produce an audible sound, together with its treatment and duration, has already been considered under the head of acute and chronic laryngitis. In the same way has destruction of one or both cords been mentioned under the head of syphilitic laryngitis.

The third cause of aphonia, the cicatrization following operations, wounds, or ulcers, and gluing the edges of the cords together, has been hinted at under the head of stenosis, but is of sufficient importance to deserve a more detailed description.

Aphonia due to Cicatricial Adhesion.

In cases of linear ulcers lying along the free edge of the vocal cords, especially toward the anterior part, cicatricial tissue is formed by the healing of the sores, which is very apt to connect the edges of the cords at their insertion into the thyroid cartilage. This cicatrization, moving from before backward with the healing of the ulcers, produces a gluing together of the cords in the same direction.

By the contraction of the newly formed tissue the edges are drawn together until the end of the ulcer is reached, thus virtually shortening the vocal cords and glottis until only a small triangular hole is left, through which the air rushes inward and outward with a whizzing, and often whistling noise.

Vocalization being painful and the voice usually hoarse in cases of long linear ulcers of the cords, the patient desists from the use of the voice, and is advised to do so by the medical practitioner who has not made a laryngoscopic examination. But this want of movement of the vocal cords favors the formation of the cicatricial tissue, and when once a connection between the edges of the cords is established, it rapidly travels backward, making vibration impossible, and causing dyspnœa by closing the glottis.

The same union of the cords takes place after an unsuccessful suicidal attempt to cut the throat, in which an incision in a transverse direction is made in the angle of the thyroid cartilage at a point where the vocal cords are inserted, and cuts them longitudinally or more frequently obliquely. The large vessels of the neck not having been severed, the wound heals rapidly, and in doing so connects the edges of the cut cords by cicatricial tissue.

It is curious to note what a small opening of the glottis will admit sufficient air for the wants of the system, provided it grows smaller gradually. The quantity of air taken in through such a greatly contracted glottis would be altogether insufficient and death by asphyxia would result if the glottis were reduced to such a size suddenly.

Treatment.—The treatment in such cases consists in cutting through the cicatricial tissue connecting the edges of the cords with the laryngeal lancet, or the galvano-cautery knife. After the division the edges should be cauterized with solid nitrate of silver, and the patient required to use his voice by talking or reading aloud, even though the voice should be hoarse and vocalization painful, in order to prevent a reformation of cicatricial tissue and a reunion of the free edges of the cords.

In making the section of the cicatrix the epiglottis must be held back by the forceps described above, so as to obtain a good view of the anterior angle of the glottis.

If the opening of the glottis is so small that the system suffers from want of oxygen, and the throat of the patient is irritable and must be educated to bear the introduction of the instruments, so that immediate relief of the dyspnœa cannot be obtained by division of the cicatrix, tracheotomy or, better, laryngotomy should be resorted to without hesitation or delay. If the latter operation is decided upon, it is often possible to separate the cords by section from below, introducing the knife through the external wound, and cauterizing the cut edges in the same way, so that the laryngotomy wound can be closed immediately, when the introduction of a tube becomes unnecessary. This of course to a very great extent increases the chances of a speedy recovery from the operation. If however the division cannot be made from below, the tracheotomy tube must be introduced and the wound allowed to heal around it before any attempts at laryngoscopic ex-

amination or operative interference from above should be made.

After the division has been made and the edges of the cords have healed, the voice frequently remains hoarse on account of the increased weight and thickness of the vocal cords by reason of inflammatory infiltration and hyperplasia. In this case a plan of treatment must be adopted with a view to remove this obstacle to clear phonation.

Aphonia due to Paralysis.

The most common cause of aphonia is paralysis of some of the muscles moving the vocal cords and employed in vocalization. Several varieties of paralysis of the cords are observed, such as unilateral paralysis or bilateral paralysis of the cords, paralysis of the abductors, or paralysis of the tensors and adductor muscles, or finally hysterical aphonia, in which at one time one set of muscles is affected, while at another time another set will refuse to act. All of these are classed under the common head of aphonia due to paralysis.

Symptoms.—If both vocal cords are affected, no sound whatever will be heard when the patient attempts to speak, except the accidental friction sound produced by the exhaled air striking against the projections in the cavities above the larynx. Laryngoscopic examination informs us that the vocal cords are relaxed and widely separated from each other, forming the glottis as we see it in quiet breathing. In many cases the cords are seen to make an attempt to approach each other when the patient essays

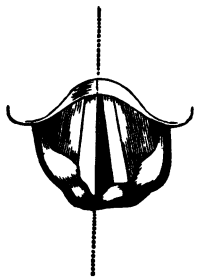
phonation, but instantly fall back into their original position. This is caused by the sphincter glottidis refusing to act while the crico-thyroid muscle momentarily stretches the cords.

In some cases of bilateral paralysis of the cords a faint fluttering noise is perceptible when the patient makes an effort to speak. The laryngoscopic mirror shows this to be due to an attempt at closing the glottis by the sphincter while the cords remain relaxed, not being stretched by the crico-thyroid muscle. In still other cases we notice a momentary stretching of the cords and a closing of the glottis, which, however, cannot be kept up by the affected muscles, and consequently no sound is produced.

Unilateral Paralysis.

If the muscles of one side only are affected, the cord on the other side is seen to move toward the median line, and is made tense, while the cord on the affected side remains relaxed, and applied to the wall of the larynx (Fig. 40). Here again, as in bilateral paralysis, we may have an action of the thyro-arytenoid, together with the arytenoid muscles, in moving the cords together, while the crico-thyroid on the affected side fails to stretch the cord; thus a peculiar hoarseness of the voice is produced, and the rima glottidis presents an opening of the shape of an Indian bow, the convexity of the curve being toward the affected side.

Fig. 40.



Paralysis of left vocal cord (Cohen).

If, on the other hand, the paralysis is only partial in both the sphincter and tensor muscles, the cord on the affected side moves toward its fellow sufficiently to be set in vibration; being, however, not stretched to the same extent as the healthy cord, it vibrates less rapidly. This produces an irregularity of the air motion, which we perceive as noise or hoarseness of the voice. It frequently happens that the patient is hoarse in one part of his voice only, generally in the higher notes and not in the lower registers. This is due, if no inflammation or thickening of the cord exists, to the fact that the affected muscles may be strong enough to stretch the cords and keep them approximated as long as this does not require much force, as in the lower registers, but that they are unable to perform their function when greater force is required. Thus it will be seen that upon the degree of the affection of the muscles depends the degree of aphonia due to paralysis.

Causes.—The causes of this affection of the vocal muscles are very diverse, and the prognosis in every particular case should be very guarded until their true nature is fully established. Paralysis of the cords may be caused by disease of the nerve centres, or of the branches supplying the nerve force to the muscles of the larynx; or it may be due to pressure upon the recurrent laryngeal branch of the pneumogastric nerve by tumors in the neck, such as goitre, sarcomatous infiltration of the thyroid gland, aneurism of the larger vessels, etc. It may also be due to inflammatory action and infiltration interfering with the exercise of the function of the muscles, and if of long standing this may cause atrophy of these

muscles; or it may be one of the symptoms of hysteria, which is, perhaps, the most frequent cause of aphonia in women; or, finally, it may be due to over-exertion and sudden failing or giving out of the contractile forces of the muscle.

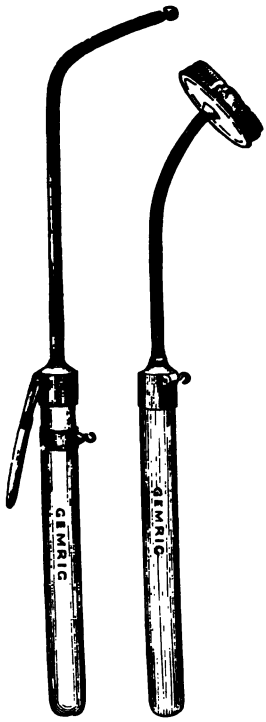
Treatment.—In all cases of loss of voice a careful examination of the larynx and the neck should be made in order to determine, if possible, the remote cause of the trouble, as upon the nature of this cause depends the tenor of the prognosis.

If disease of the nerve centres can be diagnosed by the presence of symptoms other than mere aphonia, the prognosis of course is very unfavorable, and the treatment should be directed to this systemic affection. If it is found that pressure upon the laryngeal nerve is the cause of the aphonia, this pressure if possible should be removed by operation. If inflammatory action is the cause, the treatment for chronic inflammations should at first be resorted to, and then the specific for local paralysis of the cords, viz., electricity, should be used, as it should be also in cases depending upon hysteria, or caused by over-exertion of the voice. In the latter case, however, a strong solution of nitrate of silver applied to the cords often has a very beneficial effect by its stimulating action.

Electricity applied externally acts as a local tonic, and frequently is very beneficial in allaying an acute irritation, such as is produced by the applications to the larynx of astringents in the form of powder, without interfering with their intended action. But in aphonia dependent upon paralysis this mode of applying electricity avails nothing, no matter how

long its use may be continued. To be of benefit, the current should in such cases go directly through the affected muscles. This may be accomplished by Mackenzie's laryngeal electrode (Fig. 41).

FIG. 41.



Mackenzie's laryngeal electrode.

This instrument is composed of a handle of glass, wood, or hard rubber, into which is screwed an insulated copper wire curved at the end and terminating in a small platinum ball. In order to prevent the

current from passing through the electrode while being introduced, the handle is furnished with an interrupter, a lever supported by a spring which is in metallic connection by a hinge with the wire at one end. The other end is furnished with a handle of some non-conducting substance, such as glass, bone, or rubber, for the purpose of affording a hold for the forefinger to depress the lever and keep it in contact with a metallic ring surrounding the handles, to which one of the connecting wires from the battery is attached. As long as the lever is kept down upon the ring, the current is passing, but is interrupted as soon as it is lifted by the supporting spring when the pressure is taken off. The other pole of the battery is attached to an ordinary electrode, and is given to the patient to press against the neck on one side or the other of the larynx. But as this is inconvenient, and the patient in the act of gagging frequently breaks the current by removing the pole from the skin, it has been found more convenient to connect this pole with a metal plate, which is covered with sponge, and which rests in contact with the skin upon the outside of the larynx, and is secured in that position by a band attached to the ends of the plate, and passing around the neck of the patient. In applying the electricity to the affected muscles, the plate is placed over the larynx, the sponge having first been moistened with salt and water. Next the laryngeal mirror is introduced until a good view of the larynx is obtained. Then the electrode is quickly passed down until the platinum ball lies in the inter-arytenoid space. While introducing the electrode the finger must be kept

off the lever, and contact must not be made until the parts to be faradized are reached. In some cases, as, for instance, when paralysis of the arytenoid muscle alone can be diagnosed, both poles are introduced into the larynx. The instrument made for this purpose is very similar to the one just described. It has two covered wires instead of one, which run parallel with each other to within a short distance of their bulbed ends, when they separate so as to take the parts to be excited between them. The wires being flexible, the distance between the bulbs or balls can be increased or diminished as the case may require. Contact is made by the lever when the electrode is in position. Many patients can endure a comparatively strong current for a considerable length of time, but the instrument should invariably be withdrawn as soon as gagging sets in, for the bulb of the electrode is easily displaced by the convulsive movements of the larynx.

Internally tonics, and especially strychnia, should be given, for almost always the general health is impaired, partly by the cause of the paralysis itself, and partly by the mental anxiety caused by the loss of voice. Exercise in the fresh air, and pleasant mental diversion should be strongly advised. In hysterical aphonia the salts of bromine should be administered.

The duration of the disease is very uncertain. It varies with the cause and the length of time the loss of voice has existed before treatment was commenced. There are cases in which the aphonia, due to loss of contractility of the muscles, comes on suddenly, and is often removed by *one* application of

the poles of the battery. In most cases not due to disease of the nerve centres or to pressure upon the laryngeal nerve, the voice returns gradually and slowly, and many applications are necessary to restore it. This is especially the case with aphonia due to hysteria, which often requires many months of patient treatment before any improvement is noticed. But on the other hand the voice in these cases often suddenly reappears, sometimes permanently, sometimes for a short time only. Females are more frequently affected in this way, but we find hysterical aphonia also in males.

Aphonia due to the Presence of Foreign Bodies.

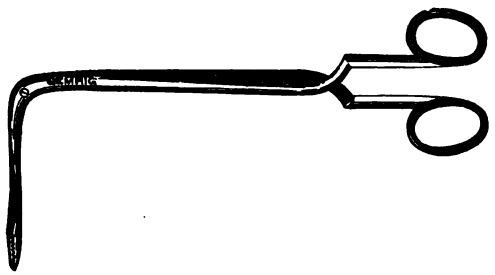
If the aphonia is due to the presence of a foreign body, accidentally introduced, it should be removed at once. Usually such foreign bodies are pins and fish-bones, which with their sharp points penetrate the mucous membrane, and are thus held in position, while other substances such as buttons, seeds of various kinds, and small pebbles, if inhaled into the larynx, are either expelled by a fit of violent coughing, or fall down into the trachea or bronchi, whence they cannot be extracted. Of foreign bodies causing aphonia, pins are most frequently found, especially in women. The almost universal habit of putting pins in their mouths frequently leads to the sudden inhaling of one of them when the woman is startled. Fish-bones, usually of small size, as well as small splinters of bone, may enter the larynx while eating. An inspiration taken

during the act of swallowing may cause a part of the food to enter the larynx, and a fit of coughing follows in order to expel the foreign body. This is commonly called "*food going the wrong way.*" If a bone thus enters the larynx it is apt to become embedded in the soft tissues of this organ, when actual contact with the cords or the irritation and swelling of them cause aphonia. The same occurs when a pin has been inhaled. Occasionally we find bristles from a tooth-brush, pieces of straw, which some persons are in the habit of chewing, pieces of tooth-picks, bristles from the ears of wheat, egg- and oyster-shell splinters, etc., as foreign bodies. All these are, however, more commonly arrested before entering the larynx proper, and are most frequently found in the glosso-epiglottic folds or grooves, where by their piercing the mucous membrane they create an irritation which lasts for some time after the removal of the foreign body. It is, therefore, very common for persons to apply to a physician for the removal of a fish-bone, oyster-shell splinter, or piece of egg-shell, which on examination does not exist, but which undoubtedly had been there long enough to cause an irritation, and had either been removed, unnoticed by the patient, by coughing or in the act of swallowing. Under such circumstances it is often difficult to convince the patient that there is nothing in his throat but the irritation left by the foreign body, which will subside in a very few days, and the practitioner is sorely tempted to practise a little fraud in order to obtain the patient's good opinion of his skill.

For the removal of foreign bodies from the larynx

or fauces, as well as for the extraction of tumors in these cavities and in the nasal cavity, numerous instruments have been invented, some of which I will describe here before entering on the subject of neoplasms and their removal. The great desideratum in such an instrument is that it should be a pair of forceps curved at the end, that it should be strong enough to enable the operator to make traction without its slipping, and that its body should occupy as little room as possible. When the foreign body is lodged in the fauces or glosso-epiglottic grooves,

FIG. 42.



Mackenzie's laryngeal forceps.

and is not too tightly embedded, the already described sponge-holder or epiglottis forceps answers admirably, but when the body is lower down or is tightly embedded, an instrument of different construction must be employed. The most useful kind of forceps is Mackenzie's common laryngeal forceps, almost exclusively used by him for the removal of neoplasms and foreign bodies from the larynx (Fig. 42). It is made of steel, with stout scissors-like handles, is of considerable length, and bent at right angles, terminating in spoon-shaped extremi-

ties, which open either laterally or antero-posteriorly. In the former, the pivot upon which the blades move is at a point between the handles and the bent extremities, while in the latter it is at the bend. It is necessary to have these two forms of instruments, since foreign bodies and tumors are frequently found in such positions that they can be grasped only with one or the other form of forceps.

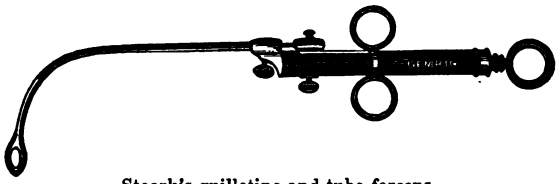
The spoon-shaped blades of the forceps are hollowed out, so that the opposing edges are sharp, and can be used for cutting off pieces of neoplasms grasped between them. In another form, which is designed expressly for the removal of foreign bodies, the blades are solid, and the opposing surfaces ribbed, so as to prevent slipping. In still another form, only one of the blades is hollow, with cutting edges, while the other presents to it a smooth surface.

The introduction of these forceps is somewhat difficult on account of the sharp bend, and the length of the extremities, but it has been found that this form is more useful in a greater number of cases than the curve employed in other instruments designed for the same purpose.

The French and German laryngoscopists use what are called "*tube-forceps*," and among them that designed by Prof. Stoerk, of Vienna, is perhaps the most useful of all (Fig. 43). It consists of a universal handle, into which a number of different forceps, slings, and cutting instruments can be inserted. The forceps used in this handle is made of a tube of metal, so curved at its extremity that its end can reach the vocal cords without difficulty. Within

this tube is a thin flexible steel wire, to the end of which two blades are attached, projecting beyond the end of the tube, and having ribbed surfaces. Their blades are separated by a spring concealed within the tube, and are approximated by retracting them within the tube. This retraction is effected by means of a slide attached to the universal handle; to this slide the end of the wire carrying the forceps blades is fastened, while the tube is inserted into the handle itself. Sometimes it happens that a

FIG. 43.



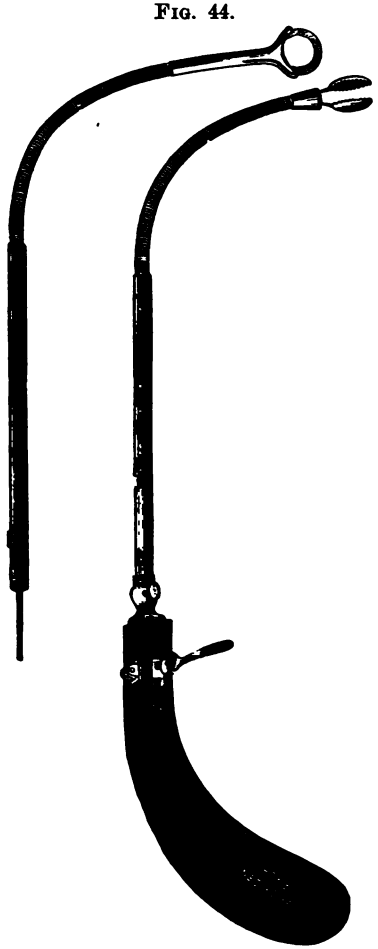
Stoerk's guillotine and tube-forceps.

tumor or foreign body is in such a position that neither a laterally nor antero-posteriorly opening forceps can be employed. For such cases a wire loop, extending from the extremity of another tube secured in the universal handle, will be found very useful. The loop can be thrown around the tumor or foreign body, and then, by making traction upon the ends of the wire secured to the slide of the handle, it can be grasped and removed.

Foreign bodies and neoplasms are frequently situated in such a position that neither an antero-posteriorly nor laterally opening forceps will readily grasp them, and it becomes a very difficult matter to remove the foreign body or neoplasm. In order to obviate this difficulty, and to obtain a forceps

which could be adapted to every case, I had a forceps made of the following description (Fig. 44):

FIG. 44.



Sailer's guillotine and tube-forceps.

A piece of stiff tube, about three inches in length,

is attached, by means of a bayonet-joint, to a wooden handle shaped like the butt of a pistol. To the end of the tube is attached a close spiral of steel wire, also about three inches long, terminating in a bell-like end-piece. Within this partially flexible tube slides a stout copper wire, to one end of which are attached the blades of the forceps, while the other end is securely fastened to a slide within the handle, which is moved by means of a trigger-like projection. Thus, by pulling the trigger the wire is drawn backward, and the blades of the forceps are closed. Both the wire and the anterior portion of the tube being flexible, any desired curve can be obtained, and the blades of the forceps may be made to open in any direction. This spiral tube-forceps I had at first attached to the Stoerk universal handle, but have found the pistol handle to be not only more convenient, but also cheaper.

Several other forms of open or tube-forceps are in use which are similar in principle to those described, and differ from them only in minor details. As a matter of course, the same size of forceps will not answer for all cases, and different shapes and sizes should therefore be kept ready for use.

CHAPTER IX.

NEOPLASMS OF THE LARYNGEAL CAVITY.

Use of Instruments.

Besides the forceps described in the foregoing chapter, cutting instruments are frequently used in operating for tumors in the laryngeal and nasal cavities.

Formerly when laryngoscopy was in its infancy, and laryngeal surgery was only beginning to be made use of, so-called open laryngeal knives were used, especially by Von Bruns, of Tübingen, who claims to have been the first to remove a tumor, or at least perform a surgical operation in the laryngeal cavity. Such an open knife consists simply of a curved steel wire, secured in a handle, and terminating in a knife blade, either sharp- or blunt-pointed. This knife blade, which is very narrow, must have its cutting edge either laterally or antero-posteriorly, so that incisions may be made either transversely or longitudinally to the axis of the glottis. In order to be able to cut both forward and backward and from side to side, the blade is made with a cutting edge on either side, like a dagger. The introduction of such an open knife into the larynx is, of course, rather hazardous, inasmuch as the epiglottis or the posterior wall of the pharynx or the tongue

would be easily wounded if the patient should gag and the knife have to be removed quickly. The laryngeal knives now in use are, therefore, covered (Fig. 39), that is, the blade is contained in a curved tube, like the one used for the tube-forceps, from which it can be protruded by means of a lever upon the handle, which either retracts the tube from over the knife blade, or pushes the latter out of the tube when the instrument is in position and the incision is to be made. As soon as gagging sets in, the pressure upon the lever is taken off, and the knife instantly is concealed within the tube, so that no harm can be done to any of the parts in removing the instrument.

Mackenzie's forceps must be regarded as cutting instruments, inasmuch as the blades have cutting edges and act like nippers.

Stoerk has attached to his universal handle (see Fig. 43) a very ingenious cutting instrument called a guillotine, which is the safest and most useful of all instruments of this class. It may be looked upon as a combination of the wire loop and the covered knife, since it consists of a permanent loop with an inner cutting edge, or, in other words, an annular knife. This, like the tube-forceps and the covered knife, may be retracted into an expanded and flattened extremity of a curved tube, and by this motion will cut off as much of a tumor as can be pressed through the opening of the knife blade. In order to shave close to the surface of the mucous membrane or the edge of the vocal cords, the blade is ground flat on one side and hollow on the other. This, of course, necessitates the employment of a

right and a left blade, and an anterior and a posterior blade. The former and the latter pair can each be inserted into the same tube; thus it is necessary to have four blades and two tubes. This guillotine may also be used in connection with the flexible spiral tube, and attached to either the Stoerk handle or to the handle of my forceps (see Fig. 44), and as it can be bent in any direction, only one knife is necessary, instead of four, as in the original instrument.

With this instrument, when once introduced into the larynx, a tumor, projecting, for instance, into the glottis and attached to the edge of one of the cords, can be surrounded and cut off by the knife even when the patient gags and struggles, inasmuch as no part of the larynx can be injured by the knife. There are, however, cases in which none of the instruments existing is applicable, and the ingenuity of the operator is called upon to devise modifications so as to adapt the instrument to the requirements of the particular case, or, if this cannot be done, to invent a new instrument altogether.

Besides the forceps and knives for the removal of tumors and foreign bodies from the larynx, an exploring instrument should be used in order to ascertain the consistency of a tumor, its attachment to the mucous membrane, whether by a slender stem or by a broad base, etc., and for various other purposes. Such an instrument is called a laryngea sound or probe. It has already been described as consisting of a piece of silver wire, bent to the proper curve and held in a mirror handle. In most cases it serves its purpose of exploring very well, but in some instances, where it is necessary that a tumor

should be lifted up in order to ascertain its location and mode of attachment, the end of the probe must be bent into the shape of a hook.

Neoplasms.

Symptoms.—Besides the aphonia, which in neoplasms is of a peculiar character, inasmuch as the voice, which is usually hoarse or sometimes quite natural, is lost suddenly and completely for a few minutes, and then returns as suddenly, often with a change of position of the head or body of the patient, we frequently observe dyspnœa. Dysphagia, on the other hand, is rarely met with, and only occurs when the tumor is so large as to interfere with the movement of the epiglottis, or when it springs from this organ. Pain is rarely observed, and usually attends only the malignant growths of the larynx. Cough, as a rule, is one of the symptoms of laryngeal tumors. Slight in most cases, but severe and harassing in a few, it is generally of a peculiar character, resembling the cough in croup, and is apt to come in paroxysms. The character, location, shape, and size of neoplasms in the larynx which may produce the foregoing symptoms are very varied. According to Mackenzie's statement, they occur most frequently upon the vocal cords, but may be found in almost any part of the larynx.

Diagnosis.—The diagnosis, as regards the presence of a tumor in the larynx, is very certain, if a careful laryngoscopic examination can be made, and the only sources of error are the eversion of the ventricle, an exceedingly rare occurrence, in which the

mucous membrane lining the pouch protrudes like a tumor between the vocal cord and the ventricular band. The second source of error is an infiltration and consequent swelling of the ventricular bands, which in that condition may hide from view a small tumor situated in the vocal cord or on the lower surface of the ventricular band itself.

Classification of Tumors in the Larynx.

Clinically, the tumors met with in the larynx are divided into two great classes. In the one are those which, after thorough operative removal, do not usually return; in the other are those which will return, if not at their former seat, at some other part of the body, even after the most careful removal of all diseased tissue. The former have received the appellation of benign tumors, the latter that of malignant tumors. It is, however, exceedingly difficult at the present time to draw the line of distinction between these two classes; even when a microscopic examination has determined the nature of a growth, it is often impossible to say whether a tumor is benign or malignant, because neoplasms which formerly were regarded as perfectly harmless have been known either to return after operation, or to change their character from a benign to a malignant form.

The tumor most frequently met with in the larynx is the *papilloma*, or wart-like growth, which springs from the mucous membrane lining the larynx. It assumes various forms, all more or less indented on their surface. This indentation has given rise to the

variety of names which this kind of neoplasm bears, such as cauliflower, raspberry, mulberry, foliated, etc. These growths are usually attached by a broad base, and only occasionally do we find them pedunculated. Their size varies from that of a mustard-seed to that of an English walnut, but is usually that of a good sized pea. Their color is mostly pink, but sometimes white or bright red. A thin section of such a growth presents under the microscope the appearance of hypertrophied papillæ of the skin or mucous membrane.

The next in frequency of occurrence is the *fibroma*, a tumor usually pedunculated, pinkish or red in color, round and sometimes irregular or wavy in outline, with a smooth surface, hard and unyielding to the touch of the sound. Its size varies from that of a small seed to that of an acorn, and is most frequently found to spring from the vocal cords.

Less frequent are the *fibro-cellular* tumors. They are usually found on the vocal cords, about the size of a pea, red or pinkish in color, sessile, with a smooth surface, and of a more or less globular shape.

Still more rarely met with are the *myxomata*, which in appearance resemble the fibromata, except that they are soft and yielding to the touch.

Only one case of *lipoma* or fatty tumor in the larynx has been reported (Von Bruns).

Cystic tumors, on the other hand, are more frequent, and resemble the fibrous tumors in shape, size, and color. They differ from them, however, in their mode of attachment, which is always broad. Their consistence depends upon the material with

which they are filled, whether serous, caseous, purulent, etc. They also usually have a zone of irritation around them, and occur most frequently on the laryngeal surface of the epiglottis.

Fasciculated sarcomata and *adenomata*, or glandular tumors, show no distinctive features, but may resemble any of the above-described neoplasms. They are very rarely met with in the larynx.

Vascular growths, or *angiomata*, also are very rare, and may be diagnosed by their dark almost black color, and granular surface, as well as by their tendency to bleed on being touched.

The so-called malignant growths found in the larynx are usually secondary deposits from a primary cancer elsewhere, and show the distinctive features of the primary growth. The most frequent of these is *epithelioma;* next in frequency are found, in the following order, *round-celled sarcoma*, *spindle-celled sarcoma*, *medullary carcinoma*, and *scirrhus*.

All of these are infiltrating and ulcerating, and give more the appearance of a localized tumefaction than of a new formation projecting into the laryngeal cavity.

Treatment.—Tumors in the laryngeal cavity producing by their mechanical interference aphonia, dyspnœa, dysphagia, and other symptoms already described, should, if possible, be removed by means of forceps or cutting instruments, and the seat of the neoplasm should be cauterized with solid nitrate of silver, or the galvano-cautery knife, to prevent a local return of the growth. In cases of secondary cancerous deposits in the larynx it becomes a difficult question as to whether surgical interference

should be attempted or not. It is, however, always advisable in such cases to tear off a small piece for microscopic examination, so as to determine the precise nature of the growth. If, however, there is the hope of obtaining by operation even a slight temporary relief from the harassing symptoms, as much as possible of the growth and infiltrated tissue should be removed.

In the removal of a tumor from the larynx, its position, size, mode of attachment, whether pedunculated or sessile, its vascularity, consistence, and other peculiarities, must be taken into consideration, in determining what mode of operation is to be adopted, and which of the many instruments is best adapted to the case.

Almost all patients suffering from neoplasms in the larynx require to be accustomed to the presence of an instrument in the laryngeal cavity by frequent introductions either of the instrument to be used in the operation or of the laryngeal sound, and it often requires weeks and months of daily practice before the removal of the tumor can be executed with safety. If, however, the removal of the tumor or foreign body is very urgent to prevent suffocation, and the patient's throat is too irritable to allow of instrumental interference, anæsthesia of the larynx may be tried before resorting to tracheotomy. This method of reducing the sensibility of the larynx was first recommended by Rossbach, and consists in freezing with the ether spray a portion of the skin on either side of the neck near the position of the lesser horns of the hyoid bone, with a view to affect the superior laryngeal nerve, which at this place

comes near the surface. In several instances I have succeeded in rendering the larynx almost completely insensible to the presence of an instrument, but in other cases have utterly failed to obtain the desired result.

In cases where dyspnœa exists to a considerable extent, on account of the tumor being so large as to interfere with the free ingress and egress of air, tracheotomy should be performed at once, as the patient is in imminent danger of suffocation. In most cases of asphyxia, caused by laryngeal growths, it is not the tumor which suddenly closes the glottis and thus prevents respiration, but this closure is usually produced by spasm of the adductor muscles of the larynx approximating the cords, and its immediate cause is some slight irritant, such as dust, carbonic acid gas, ether, etc. If the tumor is attached to the free edge of the vocal cord or ventricular band, either by a broad base or a narrow stem, and if it is not too large, it can frequently be gotten through the fenestrated knife of the guillotine, and extracted in spite of the gagging and struggles of the patient. When the open or curved knife or even the forceps is to be used, the patient should be so trained that no amount of instrumental interference will produce gagging.

Prognosis.—The prognosis, as regards the local return of a tumor, depends altogether upon its nature, which can only be determined with accuracy by careful microscopical examination.

CHAPTER X.

PHARYNGITIS.

PHARYNGITIS is an inflammation of the mucous membrane lining the pharynx, and, like laryngitis, is divided into two large groups, the *acute* and *chronic*. These are again subdivided according to the causes producing the inflammation, and according to special features characteristic of the different forms.

ACUTE PHARYNGITIS.

Acute pharyngitis is found in connection with acute laryngitis and usually precedes it, the velum palati, the pillars, and tonsils participating in the general inflammation of the mucous membrane. This condition is the so-called sore throat so common among children as well as adults.

Symptoms.—This affection is usually caused by wet feet, an exposure to cold draught, etc. It is ushered in by a more or less pronounced chill. Febrile symptoms then begin to show themselves, more or less severe according to the effect produced by the exciting cause upon the general system. The throat feels raw, swollen, and painful, deglutition becomes painful and difficult on account of the swelling of the tonsils, palate, and uvula, and a thick yellowish expectoration is thrown out. In the first stage there is usually little or no cough, but

later, when the inflammation has extended into the larynx and perhaps even into the trachea, the cough becomes very harassing. The lymphatic glands under the jaw and in the neck usually participate in the general inflammation and become swollen and painful to the touch.

On inspection of the pharynx, which is easily effected by depressing the tongue by means of a tongue-depressor, we find the anterior pillars red and swollen, and the tonsils of a purple hue, protruding beyond the anterior pillars, thus hiding from view the posterior pillars of the fauces. Frequently small white patches of cheesy consistence, easily removed with a probe, but leaving no ulcerated surface underneath them, are observed on the tonsils, especially on the posterior surface. These patches are the hardened secretions of the follicles of the glands pressed out by the swelling of the organs. They differ, however, from pseudo-membranous patches as seen in diphtheria, inasmuch as they are usually smaller, of different consistence, and leave no ulcerated or raw surface when removed. But they are frequently mistaken for diphtheritic exudations, and the affection is then after a hasty and superficial inspection called diphtheritic sore throat. It sometimes occurs that these cheesy patches are mistaken for the pus-covered surfaces of ulcers, and the patient is then subjected to severe treatment in order to heal up the supposed ulcers.

The velum palati is uniformly reddened and swollen, while the uvula is generally relaxed and hangs down into the pharyngeal cavity. The wall of the pharynx is seen to be bright red, with promi-

nent veins fully injected ramifying over its surface. The free margin of the epiglottis is usually swollen from the first.

Duration. — The duration of this affection is usually of a few days only, when the swelling and inflammation subside, and the normal condition of parts becomes re-established; if, however, the larynx is affected to any extent, the disease is prolonged by this complication, and may continue as an acute laryngitis after the inflammation of the pharynx and tonsils has subsided. But this is not usual, and does not occur in vigorous subjects, or when proper and active treatment has been adopted from the beginning of the affection.

Treatment.—The treatment should be directed to the removal of the general febrile symptoms, and to hastening the resolution of the local inflammation, as well as to the alleviation of the pain.

Saline purgatives, hot foot-baths, and sponging the body with tepid water or whiskey and water, should first be resorted to, and the diet reduced to milk, mush, gruels, and, if necessary, beef tea. All articles of food should be soft, and of the mildest nature. Spices, even in very small quantities, aggravate the local symptoms. Frequently the tumefaction of the parts is so great as to make the act of deglutition almost impossible; then only iced milk or oyster soup can be swallowed in very small quantities, and the thirst must be alleviated by small pieces of ice held in the mouth.

In this affection only are gargles of any use. They can be easily brought into direct contact with the parts most affected, namely, the soft palate with the

uvula, the posterior wall of the pharynx, the tonsils, and pillars. Strong solutions of alum, tannic acid, iron, and other astringents should be employed in the form of gargles in combination with some anodyne, or the parts should be irrigated with them by the spray from the hand atomizer, or they may be painted with a brush over the surfaces most inflamed. Solutions of nitrate of silver applied to the apparent centres of inflammation act with great promptness in reducing the swelling. An attack of this kind can frequently be cut short or prevented altogether by the early use of this remedy, provided a sufficiently strong solution be used. It has been my experience that weak solutions (fifteen to thirty grains to the ounce of water) rather increase the inflammation and pain, while a sixty, eighty, or even one hundred and twenty grain solution has an anæsthetic effect, and reduces the inflammation if applied before any inflammatory infiltration into the submucous tissue has taken place; that is, within a few hours from the start of the disease. Vapor inhalations of carbolic acid, benzoin, tar, etc., are also very advantageous. Internally, the mixture of iron, chlorate of potash, and bromide of potash, in liquid form, or in the form of lozenges, recommended in the treatment of acute laryngitis, has been found to give the most satisfactory results in allaying the irritation. Poultices of various substances applied externally to the neck tend to keep the skin soft and pliable, thus diminishing the painful pressure upon the enlarged glands. If the inflammation has been very severe, and the swelling very great, suppuration and ulceration will occur.

One attack of acute pharyngitis predisposes the patient to other attacks of the same kind, and we frequently have occasion to observe the great regularity with which the affection returns once or twice a year in the same person. It has been found that bathing the throat with cold water every morning and evening throughout the whole year, and hardening the skin against atmospheric influences by moderate exposure, even in cold weather, will frequently break up the tendency to acute pharyngitis and tonsillitis.

Traumatic Acute Pharyngitis.

As has been said, the common cause of the affection is exposure to cold, but the accidental or intentional swallowing of corrosive or very hot liquids will produce the same results, as well as the embedding of sharp foreign bodies in the tissues, such as fish-bones, splinters of bone or wood, pins, etc. In the latter case the inflammation starts from a point of irritation spreading over the whole mucous membrane covering the parts in the neighborhood. The first step in the treatment should, of course, be the removal of the offending body.

An acute pharyngitis without involvement of the soft palate and the tonsils is exceedingly rare, and is only found when the irritation has started in the pharynx and has not had time to advance to the parts above. It was, therefore, necessary to describe two affections together, viz., acute pharyngitis and acute tonsillitis, which are differentiated from each

other by their names only, while not different in reality.

The chronic forms of these two affections, on the contrary, differ widely from each other, both as regards their causes and the symptoms which they present; they will therefore be considered separately.

Chronic Pharyngitis.

Under this head the chronic inflammation of the oral pharynx, that portion of the mucous membrane which can be directly inspected by simply depressing the tongue, alone will be considered, while the diseases of the naso-pharynx will be treated together with the affections of the nasal cavities. A division of this kind, although arbitrary, is found more convenient for description, especially as there are some varieties of chronic pharyngitis which do not extend into the naso-pharynx, yet in most cases of chronic pharyngitis we find the nasal cavities also involved, and frequently the cure of the nasal trouble is followed spontaneously by a disappearance of the chronic pharyngitis.

The chronic forms of pharyngitis, like those of laryngitis, must be considered under different heads. They are to be distinguished from each other, either by the causes of the affection or by one or more distinctive symptoms, that is to say, features peculiar to one form and absent in all others.

The simple form of chronic pharyngitis is an affection very common among all classes of patients, and especially in large cities. It is usually unheeded by the patient, unless its symptoms become

very marked, and its time of duration cannot be determined because its beginning is not noticed.

Symptoms.—The patient thus affected complains chiefly of a dryness in his throat, which causes him to swallow saliva constantly in order to moisten the parts. In the morning he is obliged to clear his throat with more or less effort, and expectorates a viscid, white mucus. There is usually a slight dry tickling cough present, of a rather nervous character. No other subjective symptoms are, as a rule, complained of.

On inspection, we see the soft palate and tonsils in a normal condition; the posterior wall of the pharynx, however, is dry and shiny, with here and there a small injected vessel running across its surface. The epiglottis, as well as the larynx itself, is usually normal.

Cause.—The causes of this affection are extremely various, and it is difficult to name any single one as producing it. The chief cause, however, in my opinion, is the inhaling of impure and foul air in crowded and badly ventilated rooms, and of the dry furnace air used in cities for warming dwellings and public buildings. Anything tending to reduce the vital forces of the patient, especially alcoholism, masturbation, and venereal excesses, will be found frequently to cause simple chronic pharyngitis in an indirect manner, and aggravate the symptoms when the affection is already in existence.

Treatment.—The treatment must consist in building up the system and in stimulating the mucous membrane of the pharynx to healthy secretion, which is, however, not so easily accomplished as it

might seem to be. In fact, chronic pharyngitis resembles very much the indolent leg ulcer, which often refuses to change its character in spite of all treatment. The hygienic treatment, which is the same for all forms of chronic pharyngitis, consists mainly in moderate exercise in fresh air; in thorough ventilation of the rooms inhabited, and especially of sleeping apartments, in the administration of tonics, such as quinine, iron, phosphorus, etc., and in cautioning the patient against the evil consequences of masturbation, venereal excesses, and intemperance.

Locally, frequent applications of a moderately strong solution of nitrate of silver (forty grains to the ounce), painted over the shiny and dry surface of the pharynx with a soft camel's-hair brush, or of a ten-grain solution in dilute glycerine, introduced by means of the atomizer, will gradually change the character of the mucous membrane in many cases. Some cases, on the other hand, improve more rapidly under the exhibition of astringents, such as tannic acid, sulphate of copper, etc., applied by the brush or atomizer. The excessive dryness is somewhat relieved by the use of benzoic acid lozenges made according to Mackenzie's fomula. Internally, the resin oil of cubebs or the cold fluid extract of the same drug in ten-drop doses on sugar, three times daily, aids very much in altering the secretions of the mucous membrane. Better still is the effect of small doses of bromide and iodide of potash in combination, which render the tenacious mucus more watery, and therefore enable it to be more easily expectorated.

The judicious use of a faradic current of electricity, or even galvano-puncture, has been recommended in these cases, and I have found that this means is a powerful agent in changing the indolent inflammation into an active one. In using the faradic current, both poles should be applied to the pharyngeal mucous membrane a short distance apart, taking one area after another into the circuit until the whole surface has been gone over.

CHAPTER XI.

PHARYNGITIS. (CONTINUED.)

Follicular Pharyngitis.

Follicular pharyngitis is a form of chronic inflammation of the pharyngeal mucous membrane in which the follicles are seen to be enlarged and to form small eminences on the surface of the pharynx. These follicles are exceedingly numerous, and when irritated secrete a thick whitish liquid which is seen clinging to the wall of the pharynx in long strings.

Symptoms.—The symptoms complained of by the patient are a feeling of fulness, dryness, slight cough, and a thick tenacious phlegm which cannot easily be expectorated except after prolonged hawking. On inspection the mucous membrane is seen to be of a light reddish-gray color, while the little enlarged follicles are of a deeper red. Injected vessels are observed running over the dry and shiny surface of the posterior wall of the pharynx.

Treatment.—The exciting causes being the same in this form as in simple chronic inflammation of the pharynx, the treatment also is nearly the same. The only variation is that a stronger solution of nitrate of silver should be used, and that the enlarged follicles alone should be touched with it.

It has been recommended to cut out or rather to make an incision into the enlarged follicles, but unless they are suppurating, an occasional incident, very little is gained by such an operation, which is very tedious both for the patient and the operator.

Gastric Pharyngitis.

The same symptoms and appearances of the parts affected are observed in what is called gastric pharyngitis.

Symptoms.—The patient complains of dryness, fulness, and frequently rawness of the throat, together with a slight cough of a more or less nervous character, and with a tough tenacious expectoration of whitish or yellowish color.

On inspection we see the mucous membrane of the pharynx reddened, dry, the vessels injected, the follicles more or less enlarged, but never so numerous as in follicular pharyngitis, and long strings of mucus covering the surface of the pharynx; and in aggravated cases we see abrasions or even superficial ulcers most frequently below the level of the tongue.

Cause.—The cause, as the name implies, is to be looked for in a deranged digestion. The eructations after eating bring the acrid secretions of the stomach in contact with the delicate mucous membrane, and

cause an irritation. The same effect is produced by the eructations of gas, mainly composed of carbonic acid, which we so frequently find in dyspepsia.

Treatment.—The treatment must of course be directed to removal of the cause, by reducing the acidity of the gastric secretions through the administration of antacids, by endeavoring to remove the gastric irritability, and by building up the system with tonics, among which, in these cases, cinchona and the vegetable bitters are preferable to iron and its compounds.

In many cases no local treatment is required, and the pharyngitis improves with the digestion. When abrasions or ulcers are present, however, they should be healed up by topical applications of nitrate of silver or sulphate of copper, and stimulating inhalations of vapors or astringent solutions in the form of sprays from the atomizers should be used.

Granular Pharyngitis

Is another form of chronic pharyngitis in which again we find the symptoms and appearances already described, in which, however, the chief distinctive elements are a granular thickening of the mucous membrane of the pharynx, and laryngeal complication; that is, we have a chronic laryngitis together with the chronic pharyngitis. This form is known under the names of granular pharyngitis, clergyman's sore throat, speaker's sore throat.

Cause.—Its cause lies in a faulty use of the voice, or in abuse of it; but, in order to comprehend how

such a factor can produce such results, we must look into the mechanism of the production of the voice.[1]

We find that the voice is divided into what are called registers, which divisions are produced by alterations in the vocal cords themselves, so as to relieve the pressure brought to bear upon them, both by the muscular contraction stretching them and by the force of the current of air from the lungs. If we examine a larynx in the act of phonation, and ask the patient to raise the pitch of his voice until one of the limits of the register is reached, we will see a slight redness or congestion of the cords if the same position and tension of the cords is persisted in, and if the same amount of vibrating surface is exposed to the air-current. This congestion of the cords becomes more and more extended the higher the patient sings with the same register mechanism. The cords are thereby much more tightly stretched, and by the influx of blood are made heavier, requiring a greater amount of air force to set them into vibration. As soon, however, as the unnatural and excessive tension is removed, the congestion disappears, and the cords resume their pearl-white color. If this transgression of the natural limits of the registers is frequently repeated, the congestion of the cords does not disappear, but becomes chronic, and spreads to the neighboring mucous membrane, while the undue force of the air-current, striking the parts above when in their peculiar positions for articulation, produces an irritation and congestion of the pharyngeal mucous membrane.

[1] See "Voice in Singing," by E. Seiler: J. B. Lippincott & Co., 1875.

Men speak in the two chest-registers, constantly using either, the upper or lower according to the requirements of proper intonation. Women speak in the falsetto, but laugh and scream in the head register. Public speakers, in order to make themselves heard in a large hall, often strain their voices, that is, they force an extra amount of air through the rima glottidis, and in doing so contract the large muscles of the neck—the sterno-cleido-mastoid, the sterno-thyroid, and thyro-hyoid.

The contraction of these muscles fixes the larynx, and prevents its participation in the vibration of the column of air above and below it, and also interferes with the free action of the muscles of the larynx proper. This gives rise to an extra expenditure of muscular force, and a consequent feeling of fatigue after a few minutes of speaking or reading aloud.

The unnatural intonation used by public speakers, and especially by preachers, which consists in drawing the vocal tone of the vowels over a considerable part of the scale, thereby transgressing the natural limits of the registers, adds not only to the expenditure of muscular force, and is a consequent source of fatigue, but also increases the already existing congestion of the cords and neighboring mucous membrane. If then, after such abuse of the vocal organs for a time, the preacher or public speaker exposes himself to sudden changes of temperature, the congestion is very apt to turn into inflammation, which speedily becomes chronic, and the patient attributes his affection to this exposure after use of the voice.

Treatment.—The treatment as regards remedial agents is the same as in ordinary chronic laryngitis and pharyngitis, and will effect a cure of the disorder provided the patient does not use his voice more than absolutely necessary for ordinary conversation. As soon, however, as he resumes his work as preacher or lecturer, the symptoms return speedily, and in a short time his throat feels as sore as ever. We must, therefore, in treating such cases, add another factor to our treatment, viz., training and cultivation of the voice in speaking.

In order to do this, the patient must first be taught to sing up and down the scale, so as to learn to recognize the limits of the natural registers, and learn not to transgress them in singing or in speaking. He then must be taught to pronounce the sounds of articulate speech with the proper position of the organs, the larynx, soft palate, lips, and tongue, using as little breath as possible. He must further be instructed not to change the pitch of his voice on any one syllable, but in order to produce a rise and fall in the voice, to make the change on different syllables, that is, not to draw the vocal tone over.

It will be found that the patient, when he has acquired the natural way of speaking, can fill a larger hall or church with less exertion, and can speak for any length of time without feeling fatigued, except from his mental effort and from standing for an hour or so. A more definite description of this portion of the treatment cannot be given, because every case requires a careful study of its own peculiarities, which suggest different expedients to

attain the desired result, to be chosen with regard to the mental capacity of the patient, and to be under the direction of an intimate knowledge of the mechanism, both of the production of the voice alone and of articulation.[1]

The practice should be repeated as often as possible, and should not be extended over a period of more than fifteen minutes at one time in order not to fatigue the patient.

Specific Chronic Pharyngitis.

Secondary as well as tertiary syphilis produces a form of chronic inflammation in the mucous membrane of the throat, which has sufficient distinctive features to entitle it to be considered under a separate head.

Symptoms.—The patient complains usually of a slight cough with thick yellowish but scanty expectoration, of a fulness and dryness of the throat, and of more or less hoarseness of the voice. Often difficulty of deglutition is complained of, and frequently articulate speech has a nasal quality. On inspection we find the mucous membrane of the pharynx, soft palate, uvula, and tonsils of the peculiar brick-red hue already described under the head of Specific Laryngitis. The pharynx is dry and glistening, and ulcers more or less deep, of a rounded outline, with raised edges, and surrounded by a zone of more active inflammation, may be found almost anywhere. They are, however, most frequently seen on the pharyngeal wall, the soft palate,

[1] See "Voice in Speaking," by E. Seiler: J. B. Lippincott & Co., 1875.

the pillars and tonsils, and often on the tongue. Symmetrical patches of more active inflammation are almost always seen in specific inflammations of the throat, and form one of the distinctive features of this affection.

Gummata or syphilomata are often observed on the posterior wall of the pharynx, and may be recognized by their peculiar elasticity to the touch of the sound. An adhesion of one or both posterior pillars to the pharynx is also frequent, and is caused by cicatricial tissue resulting from the healing of ulcers. These features are so peculiar that when once seen they will always be recognized, and a confirmation of the diagnosis by the history of a primary sore is frequently unnecessary.

Treatment.—The treatment of the local affection must consist in stimulating the mucous membrane so as to remove the dryness and swelling, and in healing up the ulcerations if such are present. This is done by cauterizing them thoroughly with nitrate of silver if they are of the shallow kind, or by galvano-cautery followed by acid nitrate of mercury if they are of the deep and destructive variety, in the manner already described in the chapter on Syphilitic Laryngitis. It frequently occurs that these ulcers perforate the velum palati or even the hard palate, and then the peculiar nasal twang of the voice is heard. The progress of these perforations may be stopped by cauterization, but they cannot be closed except by a plastic operation when the edges have healed, or by fitting a plate with an elastic flap over the perforations.

The constitutional treatment must of course not

be omitted, for no amount of local applications will eradicate the disease. I have, however, found that iodide of potassium in small doses is preferable to mercury in these cases, and I am in the habit of always giving the iodide of potassium in combination with bromide of potassium, because the one seems to enhance and at the same time control the action of the other, so that they can be taken for a longer time in combination than when given separately, before producing a disturbance of digestion and eruption on the skin. A dose of from three to five grains of the iodide of potassium and ten grains of the bromide of potassium given three times a day is often borne for months without signs of iodism. The ulcers in the throat heal rapidly and the mucous membrane assumes its normal condition under such treatment.

The general health of the patient should at the same time be attended to by the administration of tonics, cod-liver oil, and salt baths, and he should be advised to take exercise in the fresh air.

Traumatic Chronic Pharyngitis.

After the ulcers or the acute inflammation produced by the accidental swallowing of hot or caustic liquids, causing acute traumatic pharyngitis, have passed away, a chronic inflammation of the mucous membrane is frequently left behind, which exhibits the same symptoms and appearances of the parts as have been described when treating of simple chronic pharyngitis. The treatment required for this form does not differ from that for other forms of the disease.

CHAPTER XII.

ELONGATED UVULA AND HYPERTROPHY OF TONSILS.

THERE are two conditions which, strictly speaking, do not come under the head of diseases of the throat, but which, on account of the symptoms they produce, are generally considered as such; these are elongated uvula and hypertrophy of the tonsils.

ELONGATED UVULA.

Elongation of the uvula is due either to genuine hypertrophy of the tissues of this organ, or to dropsical effusion, or to simple relaxation of the soft palate and uvula, thus causing the latter to hang down into the laryngeal cavity during breathing, or to come in contact with the margin of the epiglottis and posterior wall of the pharynx, as well as the back of the tongue.

Symptoms.—The symptoms produced by a relaxed condition of the uvula are principally a tickling in the throat, and consequent cough and gagging, especially when the patient assumes the recumbent position. Very little or no expectoration is observed to follow the cough. The voice has a very slight nasal sound, and sometimes a peculiar *jarring* noise accompanies the vowel sounds. On inspection the mucous membrane is usually healthy, or slightly

paler than normal, and the uvula is seen either to lie upon the back of the tongue, or to hang down so that its end cannot be seen until the patient draws up the velum palati in the effort to pronounce the vowel "*eh.*"

Treatment.—The treatment of such a condition, if of recent origin, and especially in children, consists in the application twice or even three times daily of strongly astringent solutions, such as tannic acid, alum, sulphate of zinc, and especially of the tincture of iron, to the elongated uvula by means of the brush. If such applications be continued for a considerable length of time, the uvula can gradually be made to assume its natural condition.

If the elongation is due to serous effusion, as can be determined by the peculiar club-shape which the uvula assumes, a few incisions into its integument often effect immediate cessation of all symptoms.

The cases, however, in which the relaxation has lasted for some time, and is not due to dropsical effusion, refuse to yield to the astringent treatment, and amputation of the uvula is the only proper mode of treatment. This may be done by means of a pair of scissors and forceps in cases where the patient is willing and determined to have the operation performed. The forceps should grasp the end of the uvula so as to prevent its slipping back, and to prevent also its falling into the larynx after it has been cut off by the scissors as near to the root as possible. The pain and hemorrhage in this operation are very slight; indeed, not infrequently altogether absent. The wound usually heals by first intention within

two or three days, the patient in the meanwhile being fed on soft food.

In children it often becomes a matter of some difficulty to introduce two instruments into the mouth in order to clip the uvula, and in such cases it is better to use an instrument called a uvulatome, which combines both the forceps and the scissors in one instrument.

Uvulatomes.—Various forms of instruments combining the forceps with the cutting instrument have been introduced, but they all have such disadvantages that most operators prefer to use the forceps and scissors separately, even if they have to struggle with the patient, and can perform the operation but unsatisfactorily.

Having frequent occasion, in dispensary work, to perform the operation, I endeavored to construct an instrument which would obviate the difficulties attending the use of such instruments. I had, therefore, an instrument made which consists of a pair of strong scissors, the handles of which are bent so that the hand holding them is below the mouth of the patient when the uvula is grasped. The right blade is bent at right angles, forming a hook at its end, while the left blade is pointed, and reaches to the upper margin of the bend of the right blade. Thus when the blades are separated, a triangular opening is formed into which the uvula can drop and be cut near its root, the hook-like bend of the scissors preventing its slipping backward out of the grasp of the instrument. Upon the same pivot upon which the blades of the scissors revolve are attached a pair of pronged claws lying on the under surface of the

scissors blades; they serve to catch the amputated piece (Fig. 45). With this instrument no difficulty

Fig. 45.

Seiler's uvula scissors.

will be experienced in grasping and cutting the uvula even if the patient should struggle, since the handles of the scissors are held so that the pressure

of the fingers in closing them keeps the blades in close contact with each other.

Hypertrophy of Tonsils.

An acute inflammation of the tonsils, exhibiting the different symptoms of inflammation elsewhere, is of frequent occurrence. It may be either simple or complicated with an acute pharyngitis or laryngitis, under which head it has already been described; it remains, therefore, only to describe the symptoms and treatment of chronic tonsillitis or hypertrophy of the tonsils.

Symptoms.—The symptoms of such a condition are more passive than active, that is to say, there is usually no pain or active inflammation. There exists, however, more or less obstruction to the passage of the air in breathing, which causes the patient to snore when asleep. The articulation is what is called "thick," and more or less difficulty of deglutition is observed. The degree of obstruction to breathing being dependent upon the amount of swelling of the glands, the latter may lead to alarming symptoms of dyspnœa, especially in children, when an acute coryza obstructs the nasal passages. Usually these hypertrophied glands are the seat of periodical acute inflammations, causing a great deal of suffering to the patient.

Treatment.—In treating hypertrophied tonsils we may with propriety look upon them as tumors or neoplasms, inasmuch as a microscopic examination reveals the fact that they consist of a large amount of newly formed fibrous tissue separating the glan-

dular elements, and giving the organs their peculiar hardness and firmness. Like enlarged glands elsewhere, they may be reduced by the application of astringents, which must be, however, of a very active sort, such as strong solutions of nitrate of silver or of the solid lunar caustic; iron and tannic acid have but little effect, even when the applications are frequently repeated and continued for a long time. Application of the tincture and solution of iodine to hypertrophied tonsils has been recommended, but is apt to cause unpleasant results by producing spasm of the glottis by reflex action. Injection of solutions of iodine into the substance of the gland by means of a hypodermic syringe, however, is often followed by a speedy reduction of the tonsil without causing the unpleasant results that are apt to follow the application of the drug to the mucous membrane.

The best and most satisfactory mode of treating hypertrophied tonsils is to cut them off as close to the pillars of the fauces as possible. This may be done in adults by means of a pair of forceps and a bistoury, the operation being, however, rather tedious and bloody, but, strange to say, not at all painful. A better, quicker, and more safe mode of operating is by means of an instrument called the "tonsillotome." As in the treatment of elongated uvula in children, the quickest and simplest mode of removing the offending part is the only applicable method. There are several kinds of tonsillotomes in use, the older form invented by Fahnestock, and later improved forms.

Fahnestock's tonsillotome (Fig. 46) consists mainly

of an annular knife, which moves in a split ring, through which the enlarged tonsil is pushed, and of a stout needle attached to the instrument in such a way that it can be pushed forwards, thus transfixing the gland and preventing its slipping out of the ring. When thus secured, by pulling out the handle of the tonsillotome the protruded parts are cut off with the annular knife. It will be seen that in order to use this instrument both hands are needed, and two motions must be executed, viz., the pushing back of the needle and the pulling forward of the knife.

Another instrument requiring but one hand and one motion in its use, is figured in Fig. 47. It is very similar in construction to Fahnestock's instrument, and differs from it only in the fact that the stylus or needle is replaced by a fork which, after having penetrated the tonsil, is raised, thus drawing it through the ring. The annular knife is prevented, by a catch at the stem of the instrument, from moving until the tonsil has been pierced and drawn into the ring. This catch is lifted and the knife is drawn down, cutting through the protruding tonsil with the same motion of the hand that was employed to push the fork forward.

After the operation, which is not at all painful provided the tonsils are not in a state of active inflammation, the bleeding is to be stopped by the patient rinsing his mouth with cold water. Occasionally it happens that the hemorrhage following the operation is somewhat profuse, and the cold water alone is not sufficient to stop it. In such cases, which are very rare, the cut surface may be painted with tincture of iron or nitrate of silver,

FIG. 46.

Fahnestock's tonsillotome.

FIG. 47.

Mathieu's tonsillotome.

which will control the bleeding. In fact, I am in the habit of always painting the cut surface with nitrate of silver solution, since it seems to start the process of repair at once, and at the same time protects the wound from the influence of the air. The wound usually heals within a few days by granulation, so that after the lapse of a week from the operation the parts present a normal appearance. During this time the diet of the patient should be of the mildest kind; spices and alcoholic stimulants should be avoided, and if the patient complains of great soreness, flaxseed poultices should be applied to the sides of the throat. Usually, however, no complaint is made of any soreness except during the act of swallowing, and even that is greatly diminished by taking liquid food through a tube.

CHAPTER XIII.

DISEASES OF THE NASAL CAVITIES AND NASO-PHARYNX.

THE diseases of the nasal cavities and naso-pharynx form a class of affections which are distinct from those of the larynx and pharynx, and this distinction is due chiefly to the anatomical arrangements of the parts, as well as to the physiological function of the organs.

The anatomy of the parts having already been mentioned (see Fig. 28, Chapter III.), it remains to say a few words in regard to the physiological action of the nasal cavities, and the effect produced upon

the different portions of the respiratory tract by a disturbance of the function of these parts, before we can enter upon the consideration of the pathology, and the diseases of the nasal and naso-pharyngeal cavities.

Physiology.—The function of the nasal cavities is a two-fold one: first, it serves as the organ of the sense of smell, the mechanism of which we need not here enter into, as it is treated of in detail in every text-book on general physiology.

Second, it prepares the air for respiration, by increasing its temperature, filtering it from dust, and by saturating it with moisture.

Frequent experiments have proven beyond doubt that the air respired through the nose is raised at least two degrees, Fahrenheit, in temperature, and also that the serous glands, when in a normal condition, continually pour out their watery secretion over the surface of the nasal mucous membrane, which, being taken up by the air-current, reduces the point of humidity almost to saturation. The bristle-like hairs in the vestibule, acting like a sieve, catch and retain the coarser particles of dust; while the secretion from the mucous glands, mixed with that from the serous glands, coats the surface of the mucous membrane with a sticky layer which serves to retain the finer particles of extraneous matter floating in the air.

If from any reason nasal respiration is interfered with, the air has to be inhaled through the mouth, and not being warmed or freed from its dust, and not being saturated with moisture, acts as an irritant upon the more delicate mucous membrane of the

pharynx and larynx, thus giving rise to congestion and finally chronic inflammation of the parts. Another result of mouth-breathing is insufficient expansion of the lungs, and frequently asthmatic attacks, which must be explained by the assumption that the dry, cold, and dust-laden air inhaled in large volume through the mouth causes more or less irritation and contraction of the capillary bronchi, thus preventing the air from entering the air-cells in sufficient quantity. The reader may readily verify this during an attack of acute coryza or by compressing the nostrils with a clamp, when in a short time he will feel a dryness of the mouth and pharynx, and oppression in the chest, the result of insufficient aeration of the blood. It is not the proper place here to enter further into the pernicious effects of mouth-breathing upon the whole system, which, as a matter of course, react indirectly upon the diseases of the upper air-passages, and we will, therefore, consider the pathological conditions which give rise to diseases of the nasal cavities and the naso-pharynx.

Pathology.—Most of the diseases of the nasal cavities are due to inflammatory processes, and but very few are due to traumatic injuries inflicted either from the outside by blows, falls, etc., or on the inside by foreign bodies and the instrumental interferences instituted to remove them; they may be due to tumors or neoplasms growing within the nasal or pharyngeal cavities.

If we closely observe the course of a case of simple acute coryza, we will find that the first symptom is a feeling of fulness, accompanied by sneezing,

and that this usually occurs in one nostril at first, the other one being affected later in the same manner. An inspection of the mucous membrane shows it to be in a state of congestion, and so much swollen in certain portions, especially on the inferior turbinated bone, as to touch that of the septum. This produces partial stenosis of the nasal cavity, and is felt as fulness. The congestion having continued for some time, a watery discharge makes its appearance, which is produced by a hyperstimulation of the serous glands. According to Cornil and Ranvier, lymph-corpuscles are found in this watery discharge of the early stage of acute coryza. Later, the discharge becomes thicker by the admixture of the secretion of the mucous glands and of epithelial cells which have undergone fatty degeneration, and are thrown off by the rapid formation of new cells under the stimulus of the increased blood-supply. The mucous membrane, as well as the submucous and cavernous connective tissue, becomes infiltrated with numerous leucocytes, and the venous sinuses become distended.

As the acute inflammation subsides, these conditions gradually disappear, leaving, however, the stretched mucous membrane thrown into folds as it contracts, which are especially noticeable at the posterior extremity of the inferior turbinated bone. While spreading, the inflammation involves the glandular tissue situated in the vault of the pharynx, the so-called adenoid tissue or pharyngeal tonsil, and excites it to hypersecretion of the thick yellowish mucus which is expectorated towards the end of the attack. The mucous membrane lining the accessory

cavities also participates in the general inflammation, and the accumulation of secretion within them, produced by the obstruction of the narrow outlets by tumefaction of the cavernous tissue, causes the dull pain in the head which accompanies an attack of this kind.

Frequent repetitions of acute coryza at short intervals must of necessity produce a permanency of the inflammatory infiltration in the mucous membrane and submucous tissue, which infiltration finally becomes organized so as to form connective tissue; at the same time the venous sinuses remain more or less distended, and the epithelium of the

FIG. 48.

Dilated nostril, showing anterior hypertrophy.

gland-ducts begins to proliferate. In this way permanent swellings of the mucous membrane in the nasal cavities are formed at the most pendent portions, viz., the lower edge of the inferior and sometimes of the middle turbinated bones; but they are

also found on the septum. These swellings are called hypertrophies, and are divided, according to their location, into anterior and posterior. The anterior hypertrophies (Fig. 48)—those which are situated on the anterior extremity of the turbinated bones or on the cartilaginous septum—are usually sessile and of a bright-red color, while the posterior ones—occurring on the posterior extremity of the turbinated bones (Figs. 49 and 50)—usually have a

FIG. 49.

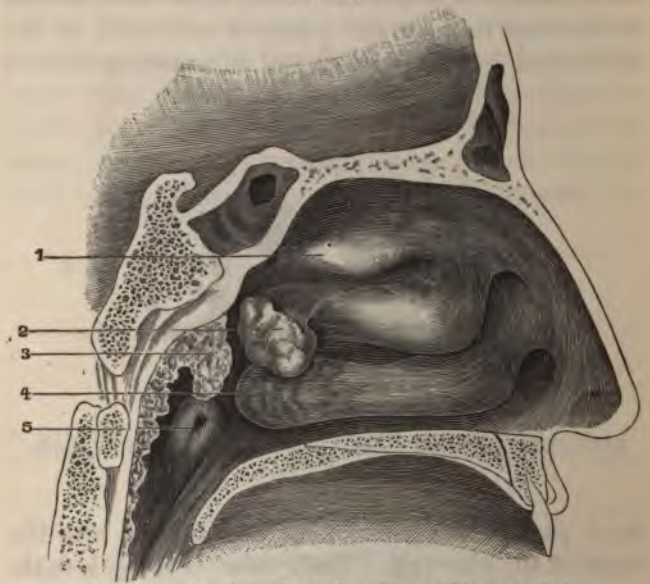
Rhinoscopic image from a case of posterior hypertrophy on middle turbinated bone.

short pedicle-like attachment and project into the vault of the pharynx. Their color is either a dark-brownish purple or a light-yellowish pink; and I find that those of a dark color are much softer than the light ones. Under the microscope a condition of the tissues in these swellings is noticed which has been already outlined.

Thus we see in a thin section of one of these hypertrophies that the epithelium is intact, although many of the cells, especially in the neighborhood of the openings of the glandular ducts, have undergone

fatty degeneration. The basement membrane upon which the cells are mounted appears thickened, and immediately beneath it we find the mucosa densely infiltrated with a small-celled infiltration, so as almost entirely to obscure the mucous tissue. The

Fig 50.



Vertical section through nasal cavities. (Diagramatic.)

1. Superior turbinated bone. 2. Middle turbinated bone, with posterior hypertrophy. 3. Section of hypertrophied pharyngeal tonsil. 4. Inferior turbinated bone. 5. Orifice of Eustachian tube.

gland-ducts are seen to be filled with proliferated epithelium, as are also the glands themselves. The bands of fibrous tissue forming the caverns in the erectile tissue are much thicker than in the normal structure, and the venous sinuses are large and

irregular in outline. Here and there we find the endothelial lining of these caverns proliferating. Scattered through the connective tissue are seen numerous lymph-corpuscles. In some sections made from hypertrophies I have noticed myxomatous change taking place in the fibrous tissue. There is but a slight difference in structure between the an-

FIG. 51.

Section of posterior hypertrophy. × 250.

1. Epithelial layer. 2. Mucous follicle. 3. Submucosa, showing inflammatory infiltration. 4. Mucous glands. 5. Venous sinuses filled with blood. 6. Small branch of arteriole. 7. Transverse section of arteriole.

terior and posterior hypertrophies—viz., that the venous sinuses in the anterior hypertrophies are not as numerous nor as large as in the posterior variety, and that usually the inflammatory infiltration, as well as the new-formed connective tissue, is much more extended: so that we notice the venous sinuses only near the periosteum when situated on the turbinated bones, and close to the perichondrium when the swelling springs from the cartilaginous portion of the septum.

Thierfelder describes and figures the microscopic appearance of a nasal hypertrophy found by accident in a subject dead from mitral insufficiency, and to the heart-lesion he ascribes the formation of the swelling in the nose. There is, however, no doubt that these swellings are of inflammatory origin, and that in Thierfelder's case it coexisted with, but was not directly caused by, the heart-trouble, as he supposes. The erectile character of the tissue composing the hypertrophies causes them to increase in bulk under certain circumstances. Thus, I have noticed that they are larger in women during the menstrual periods, and probably during the first months of pregnancy. Alcoholic stimulants cause them to swell up, as does mental and sexual excitement, in fact, anything which tends to increase the blood-pressure in the head. In some cases they are larger in damp weather, while the moisture in the atmosphere does not affect them in others. It is probable that in the first instance they have undergone myxomatous degeneration, giving them hygroscopic properties.

The glandular tissue situated in the vault of the pharynx, and known as the adenoid tissue or pharyngeal tonsil, also becomes involved in the general chronic inflammation, and is likely to become permanently hypertrophied. When thus enlarged, this tissue presents a rugged appearance in the rhinoscopic mirror, with rounded eminences projecting into the pharyngeal cavity. The secretion of this gland, when thus hypertrophied, is a thick, glairy mucus, which tightly adheres to the wall of the pharynx. Detached pieces of the tissue, when ex-

amined under the microscope, show the glandular elements greatly increased in number, the epithelium in the glands and ducts proliferating, and the scant connective tissue infiltrated with small-celled infiltration. This condition, however, but rarely interferes with the functions of the nasal cavities, except that it imparts to the voice a nasal sound by decreasing the size of the post-nasal cavity, and thus interferes with the normal nasal resonance, as I have pointed out in a paper read before the American Laryngological Association at its annual meeting, in 1881.

On the lower portion of the cartilaginous septum we frequently notice protuberances which to the eye closely resemble the sessile hypertrophies of the mucous membrane, but which, when touched with a probe, have a hard, elastic feel, the same as is conveyed to the hand when touching the cartilaginous septum in other apparently normal portions. These are not localized deviations of the septum, for we do not find a corresponding depression on the other side, but they are true hypertrophies of the cartilage, as I had occasion to prove by removing a very large one, and submitting it to microscopical examination. Gottstein claims that they are the result of a localized chronic perichondritis, secondary to the chronic inflammation of the nasal mucous membrane; and this seems very plausible to me, for these cartilaginous hypertrophies are met with only in cases of long-standing catarrh.

On the floor of the nose we frequently see bony excrescences springing from the superior maxillary bone, which were described by Dr. Harrison Allen.

These are usually congenital, and, unless they give rise to pain and inconvenience by pressure through their size, are harmless.

In many cases, deviation of the cartilaginous septum is due to an inflammatory process of long duration, and beginning early in childhood. The thin cartilaginous plate being over-nourished by the continually congested perichondrium, has deposited within its substance more new cells than are required to substitute the old and defunct ones which are being carried off, and consequently increases in bulk. But the bony framework into which it is set prevents an extension in height, and consequently a bulge to one side or the other occurs, just as a card being held edgewise between the thumb and forefinger will bulge when pressed.

Malformations in the bony walls of the nasal cavities are by no means rare, and the most common one is deviation of the bony septum. This is so frequent that Semeleder found the septum straight in only ten out of forty-nine skulls examined, and Allen found the nasal chambers normal in eighteen out of fifty-eight adult skulls examined. This deviation of the septum must in a great measure be attributed to the fact that at birth both the vertical plate of the ethmoid bone and the cribriform plate are not as yet ossified, and do not become rigid until a much later period of life, and may therefore be easily distorted by external violence applied to the nose by blows or falls. The act of blowing and wiping the nose with the handkerchief must also be considered as a factor in the production of deviation of both the bony and cartilaginous septum.

Hypertrophy or expansion of one of the turbinated bones also is not unfrequently a cause of deviation of the septum, which is crowded out of its normal position by the protrusion from the lateral wall of the nasal cavity.

This short description of the pathological conditions will, I trust, be sufficient to give an insight into the nature of the morbid processes observed in diseases of the nasal cavities; and we will, therefore, at once enter upon the consideration of these diseases.

CORYZA.

An acute inflammation of the nasal cavities which is called *coryza*, or cold in the head, exhibits the well-known symptoms of, first, a feeling of fulness in the nose, which gradually ascends into the forehead, producing there a dull frontal headache. In individuals who have very thick and long hairs growing in the vestibule, an intolerable tickling of the skin of the vestibule frequently precedes these symptoms, which is caused by a change in the position of these hairs, so that the ends tickle the opposite wall of the nostril, this erection being due to a congestion of the hair-follicles.

An irritation of the mucous membrane next shows itself, by frequent sneezing and tumefaction causing partial, or complete, stenosis accompanied by a burning sensation in the nose, and finally a copious watery discharge from the serous glands appears, which later on becomes thicker by the admixture of mucus.

Constitutional disturbances show themselves by

general langour and slight febrile symptoms, more or less pronounced in different individuals, and varying with the severity of the local inflammation.

On inspection of the anterior as well as posterior nasal cavities, which, however, is rarely made except for the sake of study, the mucous membrane will be found to be swollen and intensely red, the swelling frequently obliterating the convolutions of the turbinated bones. Abrasions or ulcerations are entirely absent in a simple coryza.

The frontal headache is produced by the tumefaction of the mucous membrane lining the frontal sinuses, obliterating the communicating aperture between them and the nasal cavity, thus shutting off the outlet for the secretions, which in producing pressure upon the distal ends of the nerve fibres cause the pain.

Cause.—This affection is caused either by a sudden chilling of the surface of the body or by local irritation of the mucous membrane through the inhalation of acrid vapors, or particles of dust, etc. Among the former, *osmic acid* is peculiarily rapid in its action, producing an active coryza in from one to two hours after the exposure to its acrid fumes.

The duration of the affection is, as every one knows, a few days. It generally disappears within nine days from the advent of the first symptoms.

Treatment.—In regard to the treatment of this affection very little is to be said, inasmuch as every one agrees that nothing can be done to shorten or stop the symptoms when once fully established, and therefore the disease is usually left to run its course. If, however, the irritation becomes so great that the

patient is compelled to sneeze incessantly, protection of the irritable mucous membrane from the air is very grateful to him. This may be accomplished by a snuff composed of gum acacia, subnitrate of bismuth, bicarbonate of sodium, and a little sulphate of morphia. The gum arabic coming in contact with moisture forms a paste, which is made still more protecting to the mucous membrane by the bismuth, when introduced into the nostrils as a snuff. The soda is added to prevent acid fermentation, and the morphia to lessen the sensibility.

Bromide of potassium given in doses of from fifteen to twenty grains every three or four hours hastens resolution somewhat in a great number of cases, while in others it seems to have no effect. The fumigation of the mucous membrane by muriate of ammonia vapor from the inhaler described in Chapter III., and also by vapors of volatile substances, such as balsam of tolu, tincture of benzoin, carbolic acid, etc., frequently hastens resolution and reduces the irritation, thus making the patient more comfortable.

Abortive treatment is, however, often successful if commenced in time. The remedies employed to cut short a cold in the head are, inhalation or rather fumigation with iodine in the form of the tincture, which must be used directly after the exposure to the cause, hot stimulating drinks, such as hot whiskey punch, a remedy which is used in every household to avert a cold of any kind. Its action is supposed to consist in an equalization of the disturbed capillary circulation on the surface of the body. In doing this it prevents a local congestion and inflammation.

If, however, the congestion has already set in, alcoholic stimulants will aggravate it.

But even then a cold in the head can be aborted in many cases by the use of the nasal douche, when obstruction of the anterior nasal chambers does not as yet exist, using the water at a temperature a little above blood heat, and adding to it some astringent together with common table salt.

Nasal Douche.—As the nasal douche is constantly employed in the treatment of acute and chronic inflammations of the lining membrane of the nasal cavities, I will here say a few words in regard to the proper use of this instrument.

The nasal douche (Fig. 52) is a vessel either of

FIG. 52.

Thudichum's nasal douche.

glass or tin, holding from one-half pint to two pints of liquid, and having near its bottom an opening. This opening is in connection with a rubber tube fitted at the free end with a nozzle of glass, rubber, or wood, and fashioned so as to fit the nostril. The vessel being filled, and the nozzle introduced into one of the nostrils of the patient, the water by gravi-

tation runs up the one side of the nose until it reaches the posterior surface of the velum palati closing the nasal cavity behind, and runs out by the other nostril, thus bathing the mucous membrane, and cleansing it by removing all hardened mucus, either directly or by loosening it so that it can be removed afterwards by blowing the nose.

There are, however, certain precautions necessary in using the nasal douche, which if disregarded lead to very unpleasant results, and there are a few cases in which a fatal inflammation of the brain has been attributed solely to the use of this instrument. Dr. Roosa, of New York, as well as Dr. L. Browne, of London, record cases of severe inflammation of the middle ear, caused by the nasal douche, and they consequently condemn this instrument as dangerous and of little use. On the other hand, Dr. L. Elsberg, of New York, and many others, among them the author, have never met with a case of injury resulting from the use of this instrument, where the precautions to be mentioned had been observed by the patient. Dr. Browne does not seem to lay much stress upon the proper density and temperature of the liquid, and this may be the cause of the unpleasant symptoms he observed in many cases following the use of the nasal douche. If, however, the precautions are closely observed, not only will there be no unpleasant effects following the use of the instrument, but, on the contrary, the patient being pleased with its action is not willing to do without it.

Precautions in the Use of the Nasal Douche.—In the first place, the bottom of the vessel should, under no circumstances, be elevated more than an inch or so

above the eyebrows of the patient, as otherwise the pressure is so great as to force the water into the frontal sinuses or into the Eustachian tubes, giving rise in the first instance to intense frontal headache, and in the second, to an inflammation of the mucous membrane of the middle ear.

The temperature of the liquid should be raised in the vessel to slightly above blood heat, so that after it has run through the tube, and has thereby lost some of its heat, it will feel neither hot nor cold to the parts.

Furthermore, the liquid used should be of the same density or specific gravity as the serum of the blood. The congested capillaries and venous sinuses being near the surface of the mucous membrane, while the liquid is on the other side, only a thin wall of epithelial cells separates them, and thus the most favorable conditions for osmosis are presented. If the liquid used in the nasal douche be of a greater specific gravity than the serum of the blood, exosmosis of the latter will take place, leaving the corpuscles more densely crowded in the capillaries, thus clogging them, and producing an irritation of the sensory nerve filaments, which we perceive as a burning pain. If, on the other hand, the liquid is of less density than the serum of the blood, endosmosis will occur, and the capillaries will be distended with the increase of liquid, which again causes pain by excitation of the nerve filaments. It becomes, therefore, necessary to use in the nasal douche a liquid which is like the serum of the blood in density as well as in temperature. Such a liquid may be obtained by mixing about fifty-six grains of salt with a pint of

water. Dr. J. G. Richardson, while engaged in his investigations on blood stains, found that a solution of fifty-six grains of salt in a pint of water produced a liquid in which blcod-corpuscles became neither crenated nor swollen, as they do when suspended either in a heavier or lighter liquid than serum, and he consequently used such a liquid with very satisfactory results. For practical purposes it is, however, sufficient to make the liquid to be used in the nasal douche, by adding an even teaspoonful of salt to a pint of water at 100° F. To this may be added any astringent, stimulating, or disinfecting solution, provided the chloride of sodium does not produce a chemical change therein, as would be the case with nitrate of silver, and provided also that the specific gravity of the liquid be not materially changed by the addition of other substances.

More important, however, than the above precautions, is the proper selection of cases. If, as is so frequently the case, in nasal catarrh, the nostrils are more or less obstructed by deviation of the septum, exostosis or *ecchondrosis* of the septum, or by anterior or posterior hypertrophies of the erectile tissue covering the turbinated bones, and by polypi, the easy outflow of the fluid is prevented, it accumulates in the post-nasal cavity, and is forced into the middle ear, the frontal sinuses, and even into the antrum, giving rise to inflammation of the mucous membrane lining these cavities. It frequently occurs that the hypertrophies act as valves, allowing the fluid to pass up, but prevent it from flowing out again. This is especially noticeable in cases of posterior hypertrophies, which, being at-

tached to the turbinated bones by a sort of pedicle, are forced by the inflowing current into the post-nasal cavity, thus making room for the liquid to pass in, but are tightly wedged into the nostril by the return current, and prevent any outflow.

In cases where the tissue is not sufficiently hypertrophied to cause an obstruction to the current of liquid from the nasal douche under ordinary conditions, it will swell up and cause obstruction when an acute congestion is present, or if the fluid used is too cold or not of the proper density. The same objections hold good when the post-nasal syringe or douche is used, for an obstruction in the nostrils also causes in this case an accumulation of liquid in the post-nasal cavity.

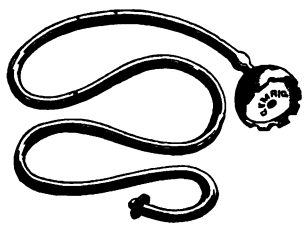
It will therefore be seen that the nasal douche should be used only in those cases of nasal disease in which there is no obstruction in the nostrils; but where there is an accumulation of secretion which, becoming inspissated, gives rise to the fetid odor noticed in ozæna, a copious stream, such as can only be obtained from the anterior or posterior nasal douche, is needed to remove the dried crusts and thoroughly cleanse the nasal cavities, and I am in the habit of adding some soda or borax to the solution of salt and water, because I have found that an alkaline solution dissolves and dislodges the crusts more readily than a neutral one. The amount of salt should, of course, be reduced in proportion to the addition of the alkali.

In cases of complete or partial stenosis of the nasal chambers, it is better to let the patient "sniff" the salt or alkaline solution up into the nose from

the hollow of the hand, or to use a hand-spray to cleanse the nasal cavities. The so-called Dobell's solution is better adapted in these cases than the plain salt and water.

Several forms of the nasal douche are in the market, some of which have great disadvantages, and are therefore to be avoided: for instance, the bottle form, which is most generally sold (Fig. 52). The narrow mouth of the bottle makes it inconvenient to introduce the salt, and impossible to use a thermometer to test the temperature, while it also prevents a thorough cleansing of the vessel. The glass tube at its bottom to which the rubber tube is attached is easily broken off, and then the instrument is useless. Furthermore, it is too expensive an apparatus for the use of the poorer class of patients.

FIG. 53.



Siphon nasal douche.

Another form, called the pocket or siphon nasal douche (Fig. 53), is very convenient and efficient in the hands of an intelligent patient, but almost useless in the majority of cases, inasmuch as it is nothing but a siphon, which must be started in order to work. It consists of a rubber tube with a nozzle at one end and a weight attached to the other. The weighted

end is sunk into the vessel containing the salt solution, which is elevated to the proper height; the air is then sucked out of the tube and the current thus started. In using this siphon-tube it is always necessary to keep the free end a little below the level of the weighted end.

The form of nasal douche which will be found most satisfactory, durable, and at the same time inexpensive, consists of a pint tin cup, with a piece of tin tube soldered in a hole cut near the bottom of the cup, to which the rubber tube is attached. The nozzle at the free end of the tube is made of hard wood soaked in paraffine, or of horn. This form of douche cannot be broken, is easily kept clean, the temperature can be accurately measured, and it costs so little that even the poorer patients can afford to use it.

Before the introduction of the nasal douche by Prof. Thudichum, a syringe made of rubber, with a curved nozzle, called the *Post-nasal Syringe* (Fig. 54),

FIG. 54.

The post-nasal syringe.

was used for the introduction of medicated solutions into the post-nasal cavity, and this instrument is frequently of great advantage at the present day in cases where strong astringent and stimulating solutions are to be employed, or in cases where the crusts of hardened mucus fail to become loosened and washed away by the gentle stream of the nasal

douche. In the latter cases the nozzle of a syringe should have a slit-like opening instead of the usual five or six small holes, because greater force is necessary to dislodge the crusts.

The introduction of the post-nasal syringe is, however, somewhat difficult, inasmuch as the nozzle has to be brought up behind the soft palate, and it should therefore not be trusted to the patients, although they often do learn to use it on themselves. After the nozzle has been brought up behind the soft palate, the patient is directed to keep his mouth open and bend his head over a basin, so that the stream of liquid shall pass out of both nostrils and not regurgitate back into the mouth.

We are now prepared to return to the consideration of the diseases of the nasal cavities, and will take up another form of acute inflammation of the lining mucous membrane of both the anterior and posterior nasal cavities, viz., hay cold.

Hay Cold.

During the summer months many persons in this country are affected by a coryza which recurs with great regularity on the same day of the year, but varying in regard to time with different individuals. It is called, according to the time of year when it occurs in different persons, Rose cold, Hay cold, Peach cold, and so on.

The different names of the affection were given to it because some persons suffer from it when the roses are in bloom, others when hay is being mown, and still others when the peaches are ripening. On

the continent of Europe very few cases are observed, while, on the contrary, in this country a great many suffer from this peculiar affection, and persons having the disease here are usually free from it when abroad.

Symptoms.—The symptoms are those of ordinary coryza of an aggravated type, the pharynx and larynx usually participating in the irritation. It is generally ushered in by a slight chill, followed by fever, frequent and violent sneezing, especially in the morning, slight cough with little expectoration, swelling and redness of the mucous membrane lining the nasal cavities, and a copious discharge from the nostrils of watery mucus, requiring the constant use of the handkerchief. The swelling gradually extends to the frontal sinuses and also to the external integument of the nose, more or less implicating the eyes and the whole face. In many cases paroxysms of an asthmatic character are observed, and a dull frontal headache is present to a greater or less degree in all cases.

The affection generally lasts from three weeks to two months, those cases occurring in the early part of summer being of shorter duration than those occurring in autumn, which invariably are suddenly terminated with the appearance of the first light frost.

The immediate causes of this affection are not as yet understood, but it is believed that certain vegetable spores which float in the air become deposited upon the mucous membrane and cause the irritation. This theory is supported by the fact that persons affected with summer cold are entirely free from it

in certain localities, and always on the open sea, the affection returning with a change of locality, or with a proximity to the shore of less than one hundred miles. Furthermore, the treatment based upon this theory is usually more effective than any other. The remote cause, however, must be sought in an abnormal condition of the mucous membrane, usually of that found in hypertrophic catarrh, which exists prior to the attack of hay cold, and in some, as yet, hidden nervous disturbance.

The fact that only a few persons are thus affected by external influences, whatever they may be, while others do not suffer at all, must be explained by the existence of an idiosyncrasy. This seems the more likely when we examine such cases of idiosyncrasy in which certain substances when eaten, even unconsciously, produce certain symptoms, frequently of a toxic character. I recall a case in which a lady was immediately attacked by violent sneezing followed by a coryza of several days' duration, when buckwheat in any form was brought near her, even without her knowledge.

Treatment.—The treatment consists chiefly in protecting the Schneiderian membrane from the influence of the air, and in reducing the pain dependent upon the swelling. This can be done by the frequent snuffing of a powder composed of gum acacia, quiniæ sulph., bismuthi subnitras, and a little morphiæ sulph. Prior to the insufflation of the powder, the nasal cavities should be freed from secretion by thoroughly washing them with the spray or sniffing from the hand, using Dobell's solution for the purpose. On account of the tumefaction and

consequent stenosis, the nasal douche should not be used. Sneezing should be prevented by pressing the forefinger hard against the lower edge of the septum of the nose, or by smelling at a bottle containing rather strong ammonia. The nose should never be blown hard, but only wiped when necessary, because both sneezing and blowing the nose increase the irritation of the mucous membrane by forcing a powerful current of air through the nasal cavities. Quinia should be given internally, as much as can be borne without producing symptoms of cinchonism, both for its antiperiodic effect and as a general tonic. A weak faradic current of electricity applied to the affected parts is frequently followed by great relief from the unpleasant symptoms, lasting for several hours after the application; the frontal headache especially can be controlled by it. One of the poles should be pressed against the forehead over the frontal sinuses, while the other, terminating in a probe-like and insulated end, carrying on its extremity a small piece of sponge moistened with salt water, should be introduced into the nostrils as high up as possible.

By this mode of treatment the affection can frequently be cut short, not to return during the same season. If the snuff and the nasal douche be used some time before the attack comes on, it can even be prevented altogether, or at least it will be mild and of short duration.

Cold applications to the forehead and back of the neck will in many cases control the paroxysms of asthma, which are probably due to reflex action on some of the branches of the pneumogastric nerve.

All nostrums and specifics for hay cold are of no avail, even if recommended by the so-called hay-fever associations, and we must treat the symptoms as they present themselves during the attack. Afterwards, however, during the winter, we must endeavor to relieve the chronic catarrh, and thus in many cases will succeed in curing our patient of the periodical exacerbations of the inflammation.

The irritation due to acute ordinary coryza if frequently repeated at short intervals will give rise to a subacute inflammation, which, if the exciting causes be present, will turn into a chronic catarrhal inflammation of the posterior and anterior nasal cavities.

CHAPTER XIV.

CHRONIC NASAL CATARRH.

A CHRONIC inflammation and consequent derangement of the normal conditions of the nasal and nasopharyngeal cavities, no matter what the cause may be, is designated as chronic nasal catarrh, and although the term catarrh is not strictly correct as applied to this group of affections, yet it is universally used, and we will therefore adhere to it.

Nasal catarrh is one of the most frequent affections in this country, so much so that it has been estimated that out of one million inhabitants of the United States, nine hundred and ninety thousand suffer therefrom, and this average is even greater in

some localities. This very frequency of the affection has probably given rise to the popular belief, which is shared to a great extent by the profession, that nasal catarrh is incurable. Yet if we intelligently examine into the pathological conditions giving rise to the symptoms we will find that, in the majority of cases, we can reasonably hope to restore the healthy condition of the mucous membrane by rational treatment, and so cure our patients, often in a comparatively short time.

Simple Chronic Catarrh.

By this term is meant a chronic catarrhal inflammation of the nasal mucous membrane, not dependent upon any systemic dyscrasia, such as scrofula, syphilis, lupus, etc., but altogether a local disease, which, however, as has already been mentioned, may give rise to systemic disturbances.

This affection is conveniently divided into two large sub-divisions, viz., into hypertrophic and atrophic nasal catarrh, which may arise independently from each other, or the atrophic may be a sequel and consequence of the hypertrophic variety. As the treatment is, however, very different, these two varieties must be considered under separate heads.

Hypertrophic Catarrh.—In this variety of the affection we observe two stages, viz., the stage of congestion with turgescence of the venous sinuses in the turbinated cavernous tissue, producing temporary obstruction; and the later stage of true hypertrophy of the cavernous tissue as well as of the mucous membrane, producing permanent occlusion.

The symptoms of the first stage are usually a superabundant watery discharge from the nostrils, which becomes greater when the patient is exposed to cold; a partial occlusion of either one, or the other, or both nostrils, which is transient in character and appears rather suddenly, when the mucous membrane is irritated by dust or by cold air, as well as from any cause which will produce an increased blood pressure in the head, such as alcoholic stimulants, emotional disturbances, etc.; a frequent recurrence of an acute coryza from trifling exposures, which, however, is not as severe nor as long continued as true acute coryza, in some cases lasting for a few hours only; and finally a slight impairment of nasal resonance. There may or may not be a discharge of thick glairy mucus from the glandular tissue of the vault of the pharynx, according to the amount of congestion or inflammation present in this region. Pharyngeal and laryngeal symptoms are usually absent, or, if present, are independent from the nasal diseases and have existed prior to it.

On inspection of the nostrils we see the mucous membrane to be red, and somewhat swollen and spongy to the touch of the probe, the cavernous tissue covering the turbinated bones, especially the lower ones, is bulged out, thus diminishing the calibre of the cavities, but by gentle pressure upon it with a flat probe it can be reduced to its normal size, and the same effect is produced by a moderately strong, constant galvanic current, if the positive pole is placed on the nape of the neck and the negative on the side of the nose over the affected

nostil. A rhinoscopic examination, which is usually somewhat difficult to make on account of the increased sensitiveness of the upper pharynx probably due to the congestion of the parts, reveals the same condition of the mucous membrane in the vault of the pharynx as was noticed in the nostrils, while the cavernous tissue over the posterior portions of the turbinated bones, if not enlarged at the time, is usually "puckered." The tissue around the openings of the Eustachian tubes may or may not be swollen, and the pharyngeal tonsil is somewhat more prominent than normal.

On account of the slight inconvenience experienced by the patient, we but seldom have the opportunity to see nasal catarrh in this stage, unless we examine every case of laryngeal or pharyngeal disease which comes under our notice, for this trouble.

The second stage, on the other hand, is the stage of catarrh most frequently met with, and presents the following symptoms. The patient complains that his nose feels stopped up, especially when he assumes the recumbent position; that during the night his mouth and throat feel dry; in the morning and at frequent intervals during the day, he has to "hawk" in order to relieve a feeling of fulness caused by the accumulation of a thick, tenacious, and more or less discolored mucus in the vault of the pharynx. Ordinarily the nostrils feel dry, but a slimy discharge appears when the mucous membrane is irritated. In many cases, a dull frontal headache is present, which at times, after an exposure to a cold and damp, or dusty atmosphere, assumes the character of neuralgia. The nasal resonance of the voice is materi-

ally impaired, causing what is termed a "nasal twang." More or less dryness of the pharynx, with follicular enlargement in the mucous membrane, and a dry, tickling, laryngeal cough is present in cases of long standing. As has already been mentioned, asthma is also frequently found to be dependent upon the nasal obstruction, but it is more particularly noticed when the obstruction is produced by nasal polypi. The sense of smell, although not lost, is considerably blunted, and as a consequence the sense of taste also is less acute, so that patients suffering from this affection require more and more seasoning in their food as the disease progresses. There may be a bad odor perceptible to the patient as well as to others, but this is not usually the case; and if present, it is is different in character and less pronounced than the odor met with so frequently in atrophic nasal catarrh.

In many cases a chronic middle ear catarrh is present, accompanied by impaired hearing, and more or less tinnitus, which is caused by closure of the Eustachian tube by mucus or by hypertrophy of the tissue around the opening. In the same manner do we find, in some cases, a catarrhal conjunctivitis which is dependent upon the nasal trouble, and is probably due to extension of the inflammation through, and to compression of the nasal opening of the lachrymal duct by the hypertrophies. In almost all cases a broadening of the bridge of the nose, and a thickening of the outer integuments of the organ are very noticeable, giving rise, in some instances, to compression of the venous trunks and consequent stasis in the capillaries of the skin, which shows itself as

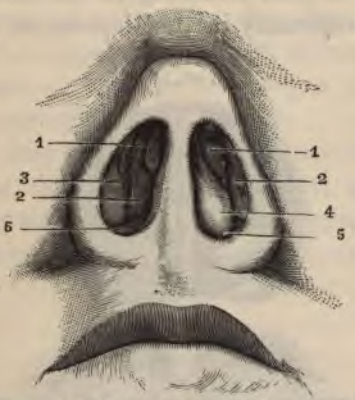
redness of the skin, almost identical in appearance with the red nose of persons addicted to too frequent use of alcoholic stimulants. These conditions often are so prominent as to amount to deformity, and it is highly gratifying to the patient to see them gradually disappear, as the mucous membrane in the nose assumes its normal condition under appropriate treatment.

On inspection of the anterior nasal cavities, which should always be made with the nasal speculum, so as to prevent stretching of the ala, and consequent disturbance of the relation of the parts to each other, we find the mucous membrane of a light-red color, darker than normal, but lighter than in either acute coryza or in the first stage of the disease. It, as well as the underlying cavernous tissue over the turbinated bones, is thickened, so as to bulge out into the nasal chamber, more or less occluding the open space; especially is this noticeable at the lower portions of the turbinated bones (see Fig. 48). These hypertrophies, as they are called, and whose anatomical nature was described in the foregoing chapter, when pressed upon with the probe cannot be reduced but only indented, which depression immediately disappears on the withdrawal of the probe. In some cases we find not only the soft tissues but also the turbinated bone itself hypertrophied, or expanded beyond its normal size, which can readily be demonstrated by the touch of the probe. When the hypertrophies are so large as to press against the septum, we frequently notice shallow ulcers of the mucous membrane covering the septum at the point of contact, and spreading from thence over a

larger area. These hypertrophies when situated at the anterior portion of the lower turbinated bone are termed "anterior hypertrophies;" when on the middle turbinated bone, as seen from the opening of the nostril, they are known as "middle hypertrophies."

In cases of long standing we find thickening of the cartilaginous portion of the septum, and exostosis of the vomer, which not unfrequently is localized, and assumes a shelf-like shape (Fig. 55),

FIG. 55.



Dilated nostrils, showing localized thickening of septum.

1 1. Middle turbinated bone. 2 2. Lower turbinated bone. 3. Edge of vestibule. 4. Shelf-like projection from septum. 5 5. Floor of nose.

running the whole length of the septum, the flat surface of the shelf being below and near the floor of the nose, and leaving but a small portion of the inferior meatus pervious.

Deviation of the septum and bony excrescences into the floor of the nose from the superior maxil-

lary bone, are also sometimes found to produce obstruction of the anterior nasal chambers, and their pathology and causation have already been mentioned.

A rhinoscopic examination, which usually presents no difficulty in these cases on account of a certain amount of sluggishness of the velum, shows the mucous membrane in the vault of the pharynx and at the posterior nares to be in the same state of inflammation that was noticed in the anterior nasal chambers. If the nose has not been washed out previous to the examination, flakes of thick white mucus will be seen adhering to the mucous membrane, and especially in the depression around the

FIG. 56.

Rhinoscopic image in a case of hypertrophy of pharyngeal tonsil.

opening of the Eustachian tubes, as well as in the crypts of the pharyngeal tonsil, which latter is more or less enlarged (Fig. 50). In some cases this enlargement or hypertrophy of this glandular tissue amounts almost to a new growth, and may, besides causing an obstruction to the air-current, prevent the posterior nares from being seen in the rhinoscopic mirror (Fig. 56). In other cases the cavernous

tissue covering the posterior extremities of the lower and middle turbinated bones is seen to be hypertrophied, forming tumor-like excrescences, which hang by a short thick pedicle in the nasal cavity, thus producing stenosis (Figs. 49 and 50). These posterior hypertrophies are of two varieties, viz., the kind which appears of a white color, with a deeply notched surface and of a tough, fibrous consistence, and the kind which has a purplish-brown color, with a smoother surface and much softer than the other variety. This latter kind frequently bleeds, and as the flow of blood is prevented from entering the anterior nasal chambers by the obstruction produced by the hypertrophy itself, it runs down the pharynx, and on entering the larynx gives rise to cough, thus simulating hæmoptysis.

In other cases, still, we notice protuberances on one side, or on both, of the vomer, usually of a lighter color than the rest of the mucous membrane (Fig. 57), which may be the posterior extremities of

FIG. 57.

Rhinoscopic image in case of a hypertrophic tissue on the vomer.

the shelf-like projections from the septum, or may be exostoses from the vomer, or finally, more frequently are hypertrophies of the mucous membrane

and its underlying tissue. Ulcerations are but rarely seen in the post-nasal cavity in this form of chronic nasal catarrh.

Causes.—The causes of chronic nasal catarrh are very numerous, and it is difficult to name any one in particular, but most of them are intimately connected with the pleasures and vices of civilized life, for this disease is not found among the lower animals, and but seldom among the uncivilized races of man. As has been said, a frequent repetition at short intervals of an acute coryza, which sequence often happens in our changeable climate, predisposes the mucous membrane to chronic inflammation, and thus weakening the tone of the muscular fibres surrounding the sinuses in the cavernous tissue, causes them to become distended and form the hypertrophies.

The breathing of impure air in ill-ventilated rooms, and especially at night and during sleep, is a frequent cause. So, also, is inhalation of air filled with dust, and particularly dust composed of filaments of cotton or wool, such as is to be found in cotton mills, and in rooms, the floors of which are covered with carpet. This is probably the reason why this disease is so much more prevalent in America and England than on the continent of Europe, where carpets are only to be found in the houses of the wealthy. Alcoholism, masturbation, venereal excesses, and anything that tends to lower the vitality of the system, must be looked upon as causes of nasal catarrh.

Partial or complete stenosis, produced by the introduction of foreign bodies into the nostrils, by

congenital or acquired malformation of the bony framework of the nose, or by neoplasms of any kind, will cause chronic nasal catarrh. This is a point of great importance, for, as we have seen, nasal stenosis is produced by the catarrh itself, and is kept up by it. It would, therefore, be reasonable to suppose that if the obstruction to nasal breathing is removed the chronic inflammation will either disappear per *vis medicatrix naturæ*, or else will be cured by mild astringent applications, in a short time. This is fully verified by clinical observation, and gives us the key-note to the successful treatment of hypertrophic nasal catarrh.

Treatment.—The treatment of hypertrophic nasal catarrh must be directed mainly to the locality in which the disease manifests itself, viz., the mucous membrane of the nasal cavities, and must be calculated to restore that mucous membrane to its normal condition. Both in the first and second stage the nasal cavities must be kept free from the accumulations of mucus, by washing them twice daily, or oftener if necessary, with the normal salt solution (an even teaspoonful of salt to a pint of water), or with Dobell's solution, which should be sniffed up the nose from the hollow of the hand. Astringent solutions thrown into the nostrils with the atomizer should be used by the practitioner only, two or three times a week, and he should select the particular astringent best suited for the individual case, such as a solution of ferric alum (four grains to the ounce of water) or weak solutions (five or ten grains to the ounce) of sulphate of zinc, copper, iron, etc.; distilled extract of witch-hazel, diluted one-half with

water; or finally, Boulton's solution, of which the following is the formula:

℞.—Tinct. iodini comp. ♏xx.
Ac. carbol. (cryst.) ♏vj.
Glycerinæ, ʒvij.
Aq. dest. ʒv.

M. et place in water bath of 100°, in tightly corked bottle, until the solution becomes colorless; then filter and use in atomizer.

A moderately strong constant current of electricity (five or six cells), the positive pole to the neck and the negative over the nose, applied two or three times a week, for about five minutes at a time, has a very beneficial effect in reducing the turgescence of the venous sinuses in the first stage, but is of no avail in reducing the permanent hypertrophies of the second stage.

In those cases in which there is dryness of the mucous membrane in the nostrils, and a thick, glairy, mucous discharge from the vault of the pharynx, the topical application of iodine to the post-nasal cavity is of great benefit in stimulating the serous glands and making the secretions more watery; besides, it has the effect of diminishing the hyper-sensitiveness of the palate, so that after a few applications a rhinoscopic view can be obtained, which before was impossible. The applications may be made through the mouth by means of a tuft of cotton soaked in the solution and held in the sponge-holder or cotton-applicator, bent to the right curve to reach the vault of the pharynx, or it may be made by passing the straight cotton-applicator through the nostril to the posterior nasal cavity along the lower meatus, which can always be done in the first stage, or even in the second where

there are no bony or hard obstructions. When the application is made through the mouth, great care must be exercised to prevent the iodine from entering the larynx, by running down along the posterior wall of the pharynx, for if it does so severe laryngeal spasm almost invariably sets in.

Three solutions of the following strength will be found to answer in most cases:

No. 1.	℞.—Iodine,	grs. viij.
	Potass. iod.	grs. xxxviij.
	Glycerinæ,	fʒvjss.
No. 2.	℞.—Iodine,	grs. xij.
	Potass. iod.	grs. lviij.
	Glycerinæ,	fʒvjss.
No. 3.	℞.—Iodine,	grs. xv.
	Potass. iod.	grs. lxxv.
	Glycerinæ,	fʒvjss.

Applications should be made with solution No. 1 until the patient ceases to feel any sensation a few minutes after. No. 2 should then be used; and when it has lost its power to irritate, No. 3 may be resorted to, but is not called for in the majority of cases. The smarting occasioned by the iodine solutions can be mitigated to a great extent by blowing some of the morphia and bismuth powder, recommended in the treatment of acute coryza and hay cold, into the nostrils.

Nitrate of silver in any form or strength, as well as astringents and irritants in the form of powder, *should under no circumstances be used in the treatment of hypertrophic nasal catarrh*, as they invariably give rise to swelling of the mucous membrane, and an in-

crease in the hypertrophies, thereby aggravating the symptoms.

Muriate of ammonia in the form of vapor, and the smoke from burning cubebs, are popular remedies in this disease; but after careful trial, extended over a long period and with a number of patients, I found that the effect of these remedies, although pleasing at first and seemingly beneficial, is entirely lost within a very short time, and it is therefore useless to try them. The only good quality they possess is that they are harmless, and may be used as psychotherapeutical agents in acting upon the mind of the patient.

There are a number of drugs which when taken internally act upon the nasal mucous membrane, and thus aid the local applications in their curative action. Among them are the iodide of potassium in small doses, combined with bromide, the oleo-resin and the cold expressed fluid extract of cubebs, the fluid extract of Grindelia robusta, iodoform, crude petroleum, etc.

Tonics, fresh air, regulation of diet, and hygienic surroundings, as well as a change of occupation (if it is found to be the exciting cause of the trouble), should be as a matter of course advised, with a view to tone up the system and remove the exciting cause.

Thus far we have considered only what might be termed the medicinal treatment of the disease, viz., the internal administration and the local application of remedial agents to the seat of the disorder, as well as attention to the general health of the patient, and it remains to describe the more important part

of the treatment, especially as regards the second stage of hypertrophic catarrh, viz., the removal of the stenosis, which may be termed the surgical treatment; for this can be accomplished only either with caustics or with cutting instruments.

Surgical treatment.—As the obstructions to the current of air in the nasal cavities vary in character, different methods must be employed for the removal of the different varieties, and this makes it necessary that they should be considered under different heads.

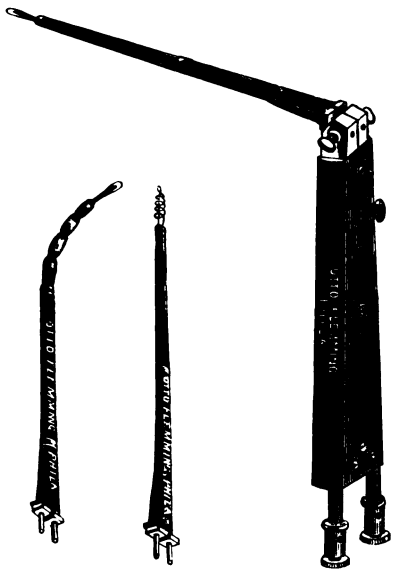
Hypertrophies.—As we have seen, both anterior, middle, and posterior hypertrophies of the cavernous tissue overlying the turbinated bones are of the most frequent occurrence, and give rise to stenosis, either partial or complete. A number of caustics have been recommended by authors on the subject, for the removal of these swellings, such as nitric acid, chromic acid, acetic acid (glacial), Vienna paste, actual and galvano-cautery, and their use is attended with more or less success; but it has been my experience that all chemical caustics, if applied to the mucous membrane over the hypertrophies in a sufficiently concentrated form to destroy the tissue below, give rise to so much pain and subsequent extensive inflammation that I have found it necessary to discard them. The same is true of the actual cautery with a glowing wire, for the amount of metal of the instrument is so small that it cools before we can apply it to the desired spot in the nasal cavity, and then only scorches the mucous membrane without destroying any of the deep-seated tissue. Furthermore, chemical caustics cannot with safety be applied to posterior hypertrophies,

as their action cannot be readily checked by neutralizing agents.

I have found that the galvano-cautery is the most satisfactory agent in removing anterior and middle hypertrophies, if they are not so large as to press against the septum, thus preventing the introduction of the platinum loop, and the application should be made in the following manner:

The rubber nasal speculum is introduced into the nostril, until its end has passed the vestibule and the

FIG. 58.



Seiler's galvano-cautery knives, with handle.

hypertrophy is brought into view; then a slender galvano-cautery knife set at an angle to the handle (Fig. 58), so as not to obstruct the view by the hand

holding the instrument, is introduced. The wires leading from the handle to the platinum loop are insulated from each other by vulcanized fibre, a substance which is a non-conductor of electricity and of heat, and is not easily burned, thus answering admirably the purpose of protecting the parts not to be burned. The current from the battery is then passed through the knife, and when the latter is at a cherry-red heat, an incision is made through the mucous membrane into the cavernous tissue of the hypertrophy. It is of great importance to have the platinum loop at the proper temperature when the incision is made, for if it is too hot considerable hemorrhage will follow, and if too cold the application is very painful. Care should also be exercised in protecting the skin of the vestibule, for if it is touched with the hot instrument the pain is very considerable and lasting. If the knife is small enough, it is not necessary to protect the mucous membrane of the septum, and even if a cut is made into it by accident no harm is done.

The immediate result of the incision is the formation of an eschar, and of a certain amount of inflammation which stands in a direct ratio to the extent of the burn, and therefore not too large an incision should be made at any one sitting; extensive inflammation having followed the operation in some cases where too much tissue had been destroyed with the galvano-cautery knife.

The ultimate result of the operation is the formation of bands of cicatricial tissue, which by their contraction bind down the swelling, and thus prevent the stenosis. The number of incisions neces-

sary to obliterate the hypertrophy will depend upon its size and firmness, but from two to four are usually sufficient.

In some cases where the mucous membrane is peculiarly sensitive, the operation is followed by an acute coryza within twenty-four hours, which can, however, in a great measure be prevented by blowing some of the morphia and bismuth powder into the nostril immediately after the burning has been accomplished. As a rule, however, no inflammation, except in the immediate neighborhood of the burn, follows, and the operation, if properly performed, is almost painless.

To insure this result, however, the temperature of the loop must be under the perfect control of the operator, and as the galvano-cautery batteries in the market do not admit of a nice and immediate adjustment of the amount of current sent through the platinum loop, I devised a battery which, having been perfected in its details by Mr. Otto Flemming, has given entire satisfaction in this and other particulars. This battery (Fig. 59) consists of a series of carbon and zinc plates connected for quantity, *i. e.*, all the zincs as well as the carbon plates are united together, and the circuit is completed through the battery fluid on the one hand, and through the platinum loop, which by means of conducting wires is connected with the terminal binding posts, on the other. This system of plates is mounted on a plate which is fastened near the top of the box, so that they hang from it into the interior of the box. Immediately beneath the plates is a hard-rubber cell containing the exciting fluid, mounted upon a

platform which can be raised or lowered by means of a treadle projecting from the box. This treadle is jointed, so that by folding it up it can be placed inside of the box out of view and harm's way. When it is depressed the platform with the cell

FIG. 59.

Seiler's galvano-cautery battery.

rises, and the system of plates is immersed in the exciting fluid, whereby the current is established. The height to which the cell is raised determines the amount of current, and consequently the amount of heat in the platinum loop, for the higher the cell the more surface of the plates is exposed to the action of the liquid, and the more current is

developed. As the treadle is actuated by the foot of the operator, it will be seen that he can control the amount of current during the operation without the aid of his hands or of an assistant, as is necessary in the case of the ordinary galvano-cautery batteries, and can regulate the temperature of the knife to a nicety.

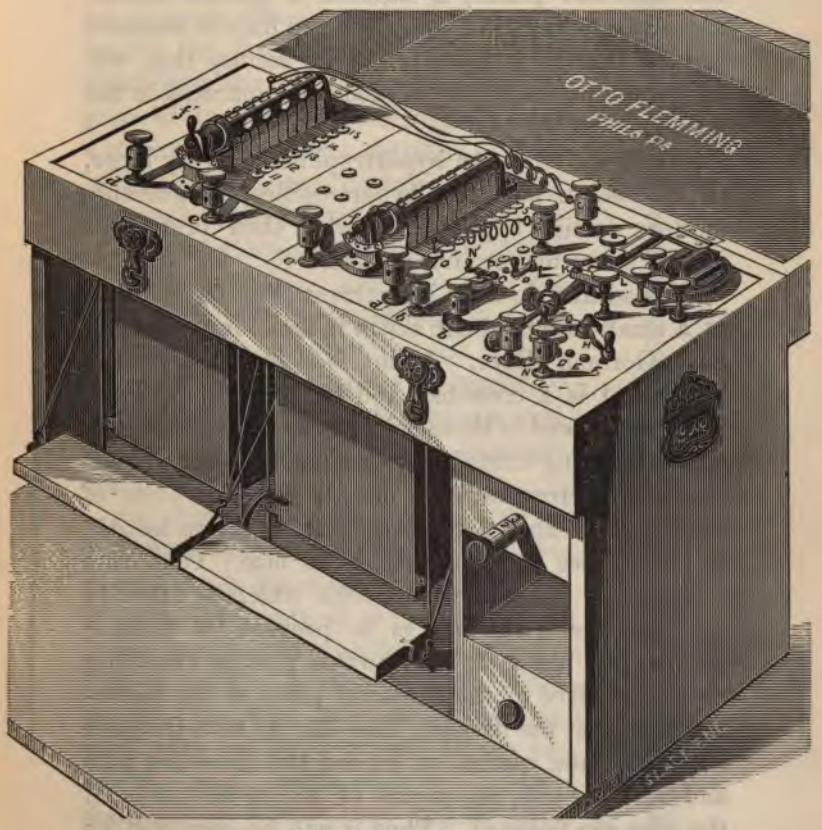
The rubber cell being large, contains a large amount of fluid, and as the plates are entirely out of the liquid when the platform is lowered, the liquid is not readily exhausted, so that the necessity of refilling the cell with fresh liquid does not occur very often; a point, the advantage of which will be apparent to every one who has ever used a battery with small cups which require refilling after each operation.

The battery of one cell is sufficient for the operations in the nose, but when larger operations are to be performed in which the heat has to be kept up for a considerable time, a two-cell battery should be employed.

As both the faradic and the galvanic current of electricity are frequently used in the treatment of diseases of the throat and nose, the advisability of having a battery which would yield the different forms of current presented itself, and at my suggestion Mr. Flemming made the universal battery (Fig. 60), which in principle is the same as the galvano-cautery battery, except that it contains two systems of plates instead of only one, which by a commutator can be combined either for quantity, when the battery is to be used for galvano-cautery, or for intensity, when the galvanic current is de-

sired. In the latter instance, the rubber cells containing the liquid must be changed for cells which are subdivided, so as to give for each pair of plates

FIG. 60.



Seiler's universal battery.

of carbon and zinc a separate compartment. This change can be effected with very little trouble, and

in a very short time, and then a galvanic battery of twenty cells is obtained which may be employed to run the electric motor, or give an electric light, as well as for medical use. In the same box containing the cells and plates, is inserted a galvano-faradic apparatus, which is independent and may be removed for the sake of portability. This battery thus will be found the most useful piece of apparatus in the office.

When the anterior hypertrophies are very large, or in cases of posterior hypertrophies, the galvano-cautery is not applicable, and I then prefer the Jarvis' snare for removing them.

This admirable little instrument (Fig. 61) consists of a small canula about seven inches long, made of hard German silver. About four inches from the lower end is a cross-bar, and the portion between this and the end is threaded and carries a screw nut, which by being turned travels up and down. A portion of the circumference of this threaded piece of the canula is filed flat throughout its entire length, and has lines engraved across its face. Over this and behind the nut, slips a tube which is fitted to the flattened screw so as to prevent its turning around, and has a slit cut into that portion overlying the flat surface of the threaded piece of the instrument, so that the division lines can be seen through it. This tube carries on its end two retention pins and a screw cap, by means of which the ends of the wire are fastened. Thus it will be seen that by turning the nut the tube will be pushed downward, and the wire loop projecting from the distal end of the canula is thereby made smaller. To the

end from which the wire loop projects, and which during the operation is pressed against the tissue, is screwed a steel, olive-shaped tip to prevent injury to the tissue, and the cutting of the wire into the softer metal of the canula. The opening in this tip should be oval to prevent the turning of the loop during the introduction of the instrument into the nose. A short curved piece of canula, carrying permanently a steel tip of the same shape as the one just described, may be substituted for the tip, and the instrument can then be used for ablating the hypertrophied pharyngeal tonsil. The wire used for anterior hypertrophies should be a fine annealed steel piano-wire, and is sold by dealers as No. 0, while for posterior hypertrophies, and for the pharyngeal tonsils, it should be several numbers thicker.

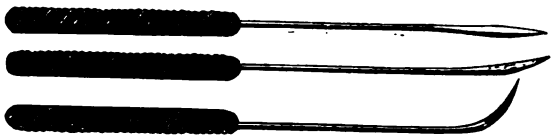
Supposing that we have a case of anterior hypertrophies which are to be ablated with the snare, we proceed as follows: The base of the hypertrophy is first transfixed with a flat and slightly curved needle, having a light metal handle (Fig. 62). A piece of the thin steel wire having been cut of the required length, both ends are pushed through the canula, and are fastened securely to the sliding tube by winding them around the retaining pins, and screwing the cap home. The loop, which should project from the olive-shaped tip for about three-quarters of an inch, longitudinal diameter, is then passed around

FIG. 61.

Jarvis' snare.

the handle of the transfixing needle, and over the growth and point of the needle as it emerges from the tissue, and traction is made on the sliding tube until the wire encircles the swelling. The tissue is then gradually snared off by turning the nut, which, pushing the sliding tube down, draws the wire loop through the tissue into the tip of the canula. When the wire has passed entirely through the swelling, which it does generally with a jerk, the hypertrophy

FIG. 62.



Jarvis' transfixing needles.

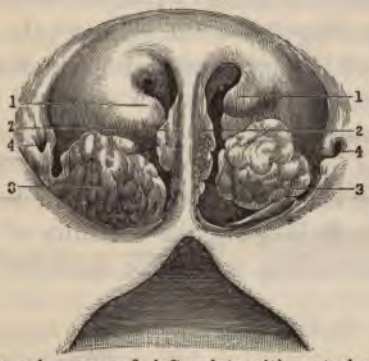
comes away sticking to the transfixing needle. The operation should occupy fifteen or twenty minutes, because it has been found that if the tissue is cut through quickly the pain is greater, and the hemorrhage sometimes quite copious. If, on the other hand, it is done slowly, the patient experiences but little pain, and hardly any bleeding follows the operation. The wound left is very small on account of the compression of the mucous membrane during the process of snaring, and generally heals by first intention, so that no special treatment is necessary. Middle hypertrophies and hypertrophic tissue on the septum can be removed in the same manner.

If we have to deal with a case of posterior hypertrophy, however (Fig. 63), the manner of operating is quite different. In this operation it is of great importance that the size of the wire loop should be

measured before introducing it into the nasal cavity, and this may be done in the following manner:

After the ends of the wire have been made fast a piece of hard wood, shaped like a wedge, is thrust into the loop. The triangular base of the wedge is

FIG. 63.



Rhinoscopic image in a case of cleft palate with posterior hypertrophies.

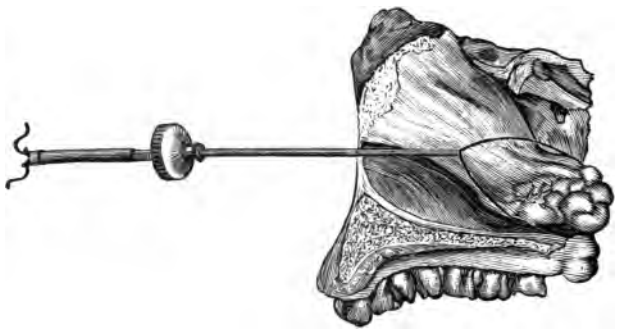
1 1. Middle turbinated bone. 2 2. Hypertrophic tissue on vomer. 3 3. Posterior hypertrophies on lower turbinated bone. 4 4. Opening of Eustachian tube.

rounded off, and its narrowest part rests on the tip of the instrument, while the wire is drawn tightly over it by pulling upon the sliding tube. The circumference of the wedge is first measured by making a wire loop of the same size and drawing it just within the orifice of the tip, at the same time noting the distance traversed by the slide-tube. This distance is added to that previously registered by the slide-tube when it clasped the wooden wedge, and the number found will be that indicating complete section of the hypertrophied tissue.

The loop might be measured by drawing it into

the instrument, but then the wire becomes "kinked" and is very apt to break at that point during the operation, while when measured in the manner described the loop retains its shape. Before introducing the instrument into the anterior nares, when posterior hypertrophies are to be removed, the loop should be made as small as possible without distorting it, by pulling down the sliding tube. As soon as the end of the instrument has entered the post-nasal cavity, the loop is again enlarged by pushing up the tube to which the ends of the wire are fastened. This has the effect of throwing the loop out and bending it toward the growth to be removed, thus greatly facilitating the catching of the hypertrophied tissue (Fig. 64). The cross-bar on the in-

FIG. 64.



Jarvis' snare in position, showing loop around a posterior hypertrophy. (Jarvis.)

strument indicates the position of the tube in relation to the natural bend of the loop. Under no circumstances should an attempt be made to engage the hypertrophy without directing and watching the

motions of the loop in the rhinoscopic mirror. It is true that there is no projection in the nares which could engage the snare that is not pathological and therefore should not be removed, as Dr. Bosworth has pointed out, yet I do not think we are justified in subjecting our patients to the pain and inconvenience, not to mention the loss of time occasioned by our efforts in groping for the growth in the dark, when by using the combined tongue-depressor and rhinoscope in connection with the tape-holders for retracting the soft palate, a sure means is provided for seeing what we are doing.

As soon as the wire has slipped into the constriction at the base of the hypertrophy, the loop should be carefully tightened around this tissue by pulling down the slide-tube. When the traction upon the wire becomes perceptible the milled nut is run down, further traction being made by rotating it. By giving a turn to the milled head until the patient winces, every minute at first, and later every three or four minutes, the growth can be snared off in the course of an hour or so. As soon as the point marked on the scale has been passed by the end of the sliding tube, a number of turns should be given to the milled nut to insure complete section of that portion of the mucous membrane overlying the end of the tube, and then the instrument can be withdrawn. The growth usually comes out clinging to the écraseur by a shred of tissue which has been drawn into it by the wire, but sometimes, although severed from its connection, it remains in the nasal cavity, and should then be removed at once with a pair of forceps. After the operation the patient

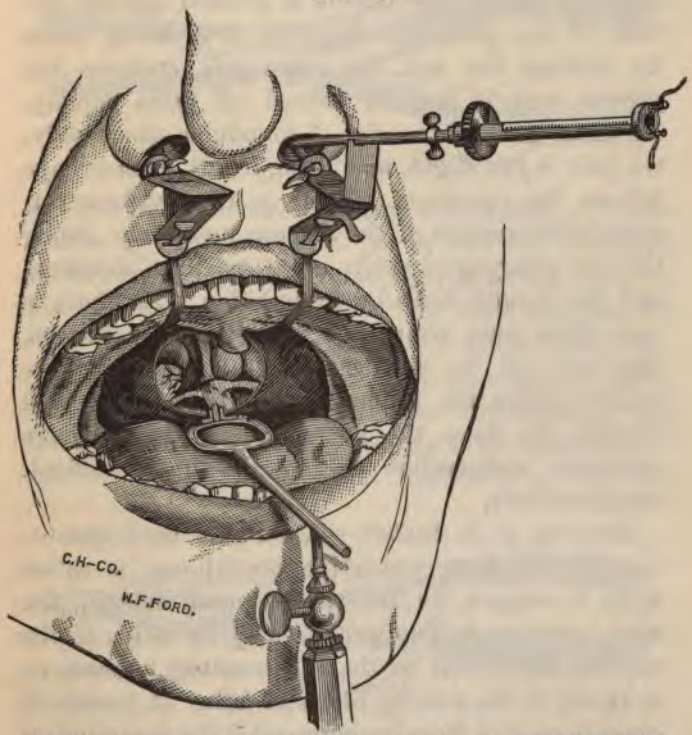
should be cautioned against blowing his nose, for fear of opening the agglutinated venous sinuses by the mechanical vibration, and so starting a hemorrhage. If any bleeding should follow the operation, it can usually be stopped by throwing the spray of a solution of perchloride of iron into the nostril.

The slow and steady constriction of the tissue has the effect of agglutinating the walls of the venous sinuses and bloodvessels, and also of drawing the edges of the wound together, so that usually, as in the case of the operation for the removal of anterior hypertrophies, very little, if any hemorrhage results, and the wound heals by first intention without giving rise to any inflammation of the mucous membrane lining the cavity. If the patient's palate is at all unruly, and by its contraction prevents the wire loop in the nasal cavity from being seen with the rhinoscopic mirror, it must be secured so as to prevent its rising (Fig. 65), as described under the head of rhinoscopy.

Localized thickenings of the cartilaginous portion of the septum or "*ecchondroses*," as they may be termed, which are not infrequently found in old cases of nasal catarrh, and which give rise to partial stenosis, especially if they are situated on the septum opposite to the pendent portion of the lower turbinated bones, may also very readily be removed with the wire snare in the same manner as the sessile anterior hypertrophies. The wire used in this operation should, however, be very thin, so as to cut readily through the cartilage, and the needle used for transfixing the base of the ecchondrosis must be quite strong, so as not to bend inwards.

Adenoid growths in the vault of the pharynx, or hypertrophied pharyngeal tonsil, are best removed with the wire snare in the following manner: Having removed the tip from the end of the canula,

FIG. 65.



Jarvis' palate retractor, rhinoscopic mirror, and snare in position during operation for removal of posterior hypertrophy.

the curved piece is screwed in its place, and a piece of wire inserted to form a loop, as in the operation for posterior hypertrophies. The loop

is then bent in such a manner that when traction is made with the sliding tube it will bend backwards; that is, in an opposite direction from the curve of the instrument. The loop is then passed behind the velum into the naso-pharyngeal cavity, and the tip of the canula is pressed against the wall of the pharynx. Traction then being made by turning the nut, the wire will encircle the growth and it may be snared off quite rapidly. As these growths consist of glandular tissue only, the pain is but slight, and little, if any, hemorrhage follows the operation. There is usually, however, some inflammation of the mucous membrane lining the naso-pharyngeal cavity of several days' duration, and the wound heals by granulation. As there is very little pain connected with these operations, they can all be performed without putting the patient under the influence of an anæsthetic, and thereby we have the advantage of the patient's conscious coöperation during the often difficult manipulations.

Deviation of the Septum.—Among the hard obstructions in the nose which the practitioner is called upon to remove for the cure of nasal catarrh, the most common is that produced by deviation of the septum, due either to the inflammatory process, or to injury to the nose by blows or falls. A variety of operations have been recommended for the relief of this condition, and different authors advocate punching a round or oval hole into the septum, or cutting out a triangular piece of the cartilage, or shaving off the projecting portion with a curved knife, etc., but the simplest, easiest to perform, and at the same

time very satisfactory operation, is the following, recommended by Dr. Steel, of St. Louis.

With a pair of strong forceps (Fig. 66), which

FIG. 66.

Steel's forceps for deviation of septum.

has inserted into one of its blades a number of knife-blades, at right angles to the surface and arranged in the shape of a star, the septum is punched at its greatest curvature once, or if the bend extends far back twice, by introducing the blade carrying the knives into the open nostril, and the unarmed blade into the closed one, and then compressing the handles. The punch is then removed, and with a pair of forceps having flat blades, (Fig. 67) the

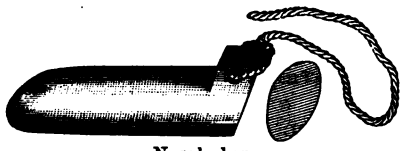
FIG. 67.

Adams' forceps.

septum is forcibly straightened, which becomes possible since the triangular pieces produced by the cut made with the punch lap, and thus the distance from the base to the top of the septum becomes diminished. Having accomplished this the forceps is removed, and a wooden or ivory plug shaped to

fit the cavity (Fig. 68) is inserted into the formerly obstructed nostril, and is kept there for about forty-eight hours, when it is replaced by a plug of cotton, which must be removed daily until the cuts in the septum have firmly united, and the septum remains straight without support. As deviation of the

FIG. 68.



Nasal plug.

septum causes deviation of the nose, and disfigures the face, the operation is often performed solely for the sake of improving the looks of the patient, and in that respect is very satisfactory.

Bony obstructions.—When the localized thickenings of the cartilaginous septum have become ossified, as they frequently do, or when the obstruction in the nose is due to an exostosis of the bony septum, or due to an enlargement of the turbinated bone itself, and not only of the soft tissues overlying it, or finally when a bony spur from the palatine process is so large as to cause stenosis, neither the wire-snare nor the galvano-cautery are of any avail, and the obstructions must be removed by breaking them up with a drill and burr. For these operations a dental engine (Fig. 69), such as is used by dentists, has to be employed to revolve the drill or burr rapidly enough to cut away the bone, or better still, a small electric motor (Fig. 70) to which the tools

FIG. 69.

Boneville's dental engine.

are attached, either directly to its spindle or by interposing a short flexible shaft between the spindle and the handpiece carrying the tools.[1] With this

FIG. 70.

Electric motor.

apparatus the speed of the drill can be regulated to a nicety, by means of the adjustable battery which belongs to it (Fig. 71), from a few hundred to fifteen thousand revolutions per minute, and its power is equal if not greater than that of the dental engine. When used for operations, the motor is suspended from the ceiling by cords which run over pulleys and carry counter-weights, so as to balance it in any position it may be placed in. This arrangement relieves the hand of all weight, and thus a much more delicate manipulation of the tool is possible

[1] The motor and battery are manufactured by the Electro-Dynamic Company, of Philadelphia.

than can be obtained when the dental engine is used, for in the latter instrument the hand has to support the weight of the hand-piece and flexible shaft or arm, and besides a good deal of the motion of the

FIG. 71.

Battery for motor.

foot, working the treadle of the fly-wheel, is communicated to the hand, making it unsteady.

The tools used in the operation are fluted and twist drills (Fig. 72), and burrs (Fig. 73) of various shapes and sizes. In order to protect the parts on the opposite side of the nostril when cutting away bony projections from the surface, Dr. Goodwillie, of New York, has devised a shield within which the burr revolves (Fig. 74). In the case of enlargement of the turbinated bone, and bony spur from the palatine process, the operation is performed as follows: The bony obstruction is first riddled with a number of holes made with a cutting drill, and its

substance is then broken down with a coarse burr, the diameter of which is greater than that of the

FIG. 72.

Drills for dental engine.

FIG. 73.

Burrs for dental engine.

FIG. 74.

Burr with shield.

drill, and finally any shred of mucous membrane or spicules of bone which remain are cut off with a pair of scissors. After the lapse of twenty-four hours, it is generally necessary to trim off the surface of the wound with scissors, as projections which have been overlooked in the first instance, then show themselves, after which the wound is allowed to heal up.

In cases where the bony obstruction springs from the flat surface of the septum, a round or olive-shaped burr, encased in a shield, is pressed against the projection, and the osseous tissue is cut, or rather ground away, until the normal surface is obtained. There is less pain or hemorrhage connected with these operations than might be expected, because the rapidly revolving drill or burr cuts only into the hard and resisting substance of the bone, while the soft tissue of the bloodvessels and nerves is not injured. In cases where it is desirable, the bone can be removed without breaking the periosteum, except to give entrance to the cutting burr.

Usually but a very moderate amount of inflammation of the mucous membrane of the nose follows these operations, and the wound in the soft tissues heals readily within a few days. As a rule, it is more convenient to place the patient under the influence of an anæsthetic, so as to have perfect control over his movements; although it is not absolutely necessary, as the pain can very readily be borne.

There are a number of cases in which we find a shelf-like projection into the anterior nasal cavity, springing from the lower portion of the septum, and extending throughout its entire length. Its anterior

portion is cartilaginous, while the posterior portion is bony, and the mucous membrane covering it is frequently atrophied and ulcerated. Its proximity to the floor of the nose and to the lower turbinated bone, causes a narrowing of the lower meatus, and to a certain extent of the upper one, thus giving rise to stenosis and catarrh (see Fig. 55). This condition may readily be mistaken for deviation of the septum, especially when the opposite side of the septum is slightly concave, and it is advisable to apply the nasal calipers, which will at once determine the nature of the projection in such cases.

These projections, which are nothing more than ecchondroses and exostoses of the septum, may be removed with the burr of the dental engine, but on account of their peculiar shape the burr is apt to slip and perforate the septum before its revolutions can be stopped. It is better to shave off the cartilaginous portion with a knife, and to cut the bony portion away with a slender metacarpal saw, the teeth of which are set with their points toward the handle, so that the saw cuts on the pull, and not on the push, as is usual (Fig. 75). If it cuts on the

FIG. 75.

Metacarpal saw.

push and if it should slip, as is often the case, we are very apt to run the point into the pharyngeal tonsil or other parts of the pharyngo-nasal cavity, and make a wound which may prove troublesome. The wound, which of course is quite extensive,

heals usually within a few days by granulation without giving rise to much inflammation of the surrounding mucous membrane.

This operation is rather more painful than any of the others described, and also more bloody, and therefore the patient must be put under the influence of an anæsthetic, and the posterior nasal cavity must be plugged to prevent the blood from flowing into the larynx during the operation.

Plugging the nose is an operation which the practitioner is frequently called upon to perform, and it will therefore not be out of place to describe it here. In text-books on surgery we find an instrument—Belloque's canula—recommended for this purpose, which, however, if at hand, in many cases proves useless on account of its great thickness. It will be found that the nose can be plugged just as well, and often better, in the following manner: A large-sized Eustachian catheter, or, if that is not at hand, a female catheter, is introduced through the lower meatus of one of the nostrils until its end comes in contact with the wall of the pharynx. A catgut string or a piece of twine, well waxed to make it stiff, is then pushed through the catheter, and when its end appears below the margin of the velum, it is seized with a pair of forceps and drawn out through the mouth. A wad of cotton, tow, lint, or any other substance which will serve the purpose, having been previously tied to a string in such a manner that two long ends hang from it, is then drawn into the pharyngeal cavity by tying one of the ends to the catgut string as it projects from the mouth, and pulling at the end projecting from the nostril, at

the same time removing the catheter. The plug of cotton will thus be wedged into the post-nasal cavity, preventing the escape of blood into the pharynx. The catgut string is then detached from the string to which the cotton is tied, which hangs out of the nostril, and may be cut off close if the plug is to remain in place for any length of time, while the other end of the string, which remains in the mouth, should be secured to the teeth in such a manner that the velum is not hindered in its motion. When the plug is to be removed, all that is necessary is to pull at this end of the string, when the plug will become detached, and can be drawn out through the mouth.

CHAPTER XV.

CHRONIC NASAL CATARRH. (CONTINUED.)

Atrophic Nasal Catarrh.

This affection, which is popularly known as dry catarrh, may either be a sequence to the hypertrophic stage (and it is not uncommon to find hypertrophies in one side of the nose and an atrophic condition of the tissues in the other), or it may be of the atrophic variety from the start.

The symptoms complained of by the patient are chiefly great dryness of the nose and throat, with the occasional expulsion of large scabs of dried secretion, complete or partial loss of the sense of

smell, and an offensive odor, not usually, however, perceived by the patient himself, but by his friends and all with whom he comes in contact. This odor, which has given rise to the term *ozæna*, by which this variety of catarrh is designated by many authors, is, however, also present in other affections, and may be noticed in cases of syphilitic ulceration of the nose, of caries, and in disease of the antrum, or it may be caused by the retention and putrefaction of the secretions in cases of foreign bodies in the nasal cavities, or when complete stenosis exists from malformation of the walls of the nose. It must, therefore, be classed as a symptom, and not as a separate affection.

On inspection of the anterior nares, we find the mucous membrane everywhere dry and shiny, with here and there brownish scabs of dried secretion adhering to it. The calibre of the nasal chambers is very much increased, and the turbinated bones are barely recognizable or altogether absent, so that nothing obstructs the view, and the wall of the pharynx can plainly be seen. Frequently erosions of the mucous membrane, especially on the septum, are seen when the scabs are removed, which lead to ulceration and perforation.

With the rhinoscope we observe the same withered condition of the mucous membrane in the naso-pharyngeal cavity, and particularly so on the pharyngeal wall, every trace of the glandular tissue or pharyngeal tonsil having disappeared. Large brownish crusts of dried secretion are here also seen, especially in the depressions at the margin of the mouth of the Eustachian tubes, and on the posterior

aspect of the vomer, places where they cannot be easily dislodged by the ordinary methods of blowing the nose, and by hawking. Erosions and ulcerations are found beneath these scabs, which are often quite extensive, and may involve the periosteum of the vomer, thus producing necrosis.

Cause.—The causes of this variety of catarrh are essentially the same as those which produce the hypertrophic form, of which, in most cases, it is a sequel. Syphilitic, scrofulous, or other specific taint of the system, has, in my opinion, no direct influence upon the causation of this form of nasal catarrh. Although we find scrofulous patients who are suffering from atrophic nasal disease, this does not prove that the taint is the cause. The reason why certain individuals have hypertrophic and others atrophic catarrh, produced, apparently, by the same exciting causes, is a question not as yet satisfactorily settled.

Treatment.—The treatment must consist chiefly in keeping the nasal cavities clean, in preventing the formation of crusts, and in stimulating the mucous membrane, and those of the glands which have not been obliterated entirely by the process of atrophy. The cleansing is best effected by means of the post-nasal syringe and the spray in the hands of the physician, and the nasal douche used by the patient. The solutions should be alkaline, so as to dissolve the mucus more readily. It is best to use Dobell's solution with the post-nasal syringe, about three times a week, and to thoroughly cleanse the nasal cavities with it of all accumulations at each sitting. If then any excoriations or ulcerations are seen, they should be touched with a sixty-grain solu-

tion of nitrate of silver and if they are deep and extensive, it is best to char the surface with the galvano-cautery before using the silver. The anterior nasal cavity should be washed thoroughly with a spray of Dobell's solution, and afterwards the mucous glands should be stimulated by applying nitrate of silver in the solid form. Dr. Bresgen, of Frankfort-on-Main, suggests the following formulæ, which are to be used successively as they lose their power of stimulation, and have proved very valuable in the treatment of this form of catarrh:

No. 1.	℞.—Arg. nit.	gr. ¾.
	Pulv. amyli,	gr. 154.
No. 2.	℞.—Arg. nit.	gr. 1½.
	Pulv. amyli,	gr. 154.
No. 3.	℞.—Arg. nit.	gr. 2⅓.
	Pulv. amyli,	gr. 154.
No. 4.	℞.—Arg. nit.	gr. 3¾.
	Pulv. amyli,	gr. 154.
No. 5.	℞.—Arg. nit.	gr. 7½.
	Pulv. amyli,	gr. 154.
No. 6.	℞.—Arg. nit.	gr. 15.
	Pulv. amyli,	gr. 154.

Dr. Gottstein recommends a plug of cotton to be introduced into the nostril to take the place of the lost lower turbinated bone, with a view to diminish the calibre of the canal, and concentrate the current of air. This also acts beneficially, not for the reason stated, however, but because the cotton irritates and stimulates the mucous membrane, and does good in this way.

Other stimulants, such as myrrh, in powder or in the form of the tincture, sulphate of iron, quiniæ

sulph., etc., and above all a moderately strong induced current of electricity may be applied locally with good results.

The general health should be looked after, and any predisposing causes removed if possible, while iodine, in the form of the iodide of potassium in small doses, and of iodide of iron, or cubebs, petroleum, Grindelia robusta, or any other drug which will stimulate the glands of the nasal mucous membrane, should be given internally.

With the best and most faithfully carried out treatment a cure cannot be effected in less than a year, and it often requires much more time than that, but most of the symptoms may be so ameliorated even in a short time, as not to annoy the patient. This is especially true of the bad odor, which can be entirely relieved by thoroughly washing out the nasal cavities and removing all the collections of mucus. If, however, the odor persists after thorough cleansing, which happens in a few cases, then the disease must be looked for in the contiguous cavities, the antrum, the frontal sinuses, or sphenoidal cells, and these must be opened and washed out with disinfectant solutions in order to relieve the patient. As there is always more or less pain connected with disease of these cavities, which is localized, it is not difficult to locate the trouble in one or the other of these contiguous cavities.

When necrosis of either the vomer or of the turbinated bones is found, the surface must be thoroughly scraped, which is best done with the burr of the dental engine, as with the scraper the necessary pressure cannot be brought to bear upon

the parts, and furthermore, there is hardly enough room to effectually use this instrument. With the rapidly revolving burr, on the other hand, we both hear and feel at once when all diseased bone has been removed, and the tool comes in contact with the harder sound osseous tissue.

Syphilitic Catarrh.

Both the secondary and tertiary manifestations of syphilis are found in the nasal cavities as inflammation, gummata, and shallow or deep ulcerations, and present the same characteristics as in the pharynx and larynx. The destruction of tissue and loss of substance occasioned by the specific ulcerations are, however, as a rule, much more extended, owing to the close contiguity of the parts, and will often cause irreparable deformity of the nose by destruction of the septum. Perforation of the septum, in fact, is very frequently met with in this disease, but is not necessarily due to syphilis in all cases, for it is occasionally found in atrophic catarrh, and is said to be found invariably in workmen employed in bichromate of potash works. A bad odor, which is, however, different in character from the odor of atrophic catarrh and of disease of the contiguous cavities, always accompanies syphilitic ulceration of the nasal cavities.

The treatment is the same as that recommended in syphilitic laryngitis and pharyngitis, except perhaps that we can employ our caustic applications more effectively in the nasal cavities than in the throat.

Lupus is occasionally found in the nose, and its manifestations are so much like those of syphilis that it becomes exceedingly difficult to recognize the disease. We find, however, usually an involvement of the skin, either at the time or soon after the disease shows itself in the nasal cavities, and this helps to confirm our diagnosis.

The treatment for this affection is described in detail in the text-books on diseases of the skin, and we need not here enter further into it, except to state that as a local application iodoform powder dusted over the ulcerated surfaces has given more satisfaction than any other topical application.

Tumors in the Nasal Cavities.

Tumors are also found in the anterior and posterior nasal cavities, and the laryngoscopist is frequently called upon to remove them.

Pathology.—Two varieties of nasal polyps are usually recognized, the mucous and the fibrous variety, to which I would add a third, the cystoid.

Like the hypertrophies of the mucous membrane and of the cartilaginous septum, these polyps are due to inflammation; and Galen recognized this fact, for Virchow[1] quotes him as saying "that the nasal polyps are due either to inflammation or develop from a node or from germinal matter." And Virchow himself[2] says that "on mucous surfaces tumors for the most part occur in places where there previously was a simple inflammatory disturbance—

[1] Die Kr. Geschwulste. [2] Loc. cit.

where the simple inflammatory hyperplasia of chronic catarrh precedes the growth of polyps."

It is therefore evident that they may occur on any portion of the nasal mucous membrane, and that they will be found more usually in those portions of

FIG. 76.

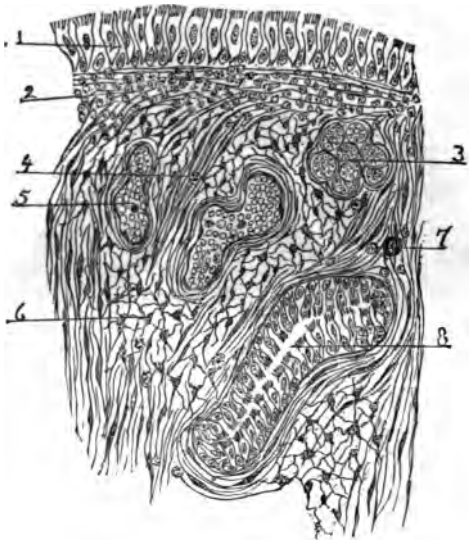
Vertical section through nasal cavities, showing nasal polypi.

the nasal cavities which are most exposed to the irritating influences of the air and dust, viz., in the respiratory portion. They are, however, also found in the antra of Highmore.

Under the microscope the mucous variety is seen to be composed chiefly of myxomatous tissue, which is intermingled with fibrous tissue and some organic

muscular fibres. Embedded in their substance we find some hypertrophied glands as well as venous sinuses, and sometimes we find in thin sections openings lined with columnar epithelium, which are probably the cross-sections of invaginated portions

FIG. 77.



Section of mucous polyp. × 300.

1. Epithelial layer, 2. Infiltrated submucous layer. 3. Mucous gland. 4. Fibrous band. 5. Venous sinus filled with blood. 6. Myxomatous tissue. 7. Transverse section of arteriole. 8. Invagination of mucous membrane.

of mucous membrane. The polyps are covered with ciliated columnar epithelium in those portions which are not exposed to the direct influence of the air, while the convexities pointing towards the nostrils

are covered with stratified epithelium. Billroth[1] describes them as retaining all the elements of the mucous membrane from which they spring. Occasionally we find that they have undergone teleangiectatic degeneration.

The more rare fibrous variety, which is very hard and of a glistening white color, stands in contrast to the soft, gelatinous, pinkish, and highly hygrometric mucous variety. Cornil and Ranvier say of the fibrous polyps: "They usually have their point of attachment in the posterior portion of the nasal cavity. They send prolongations in every direction, into all the cavities, either bending around obstacles or breaking through them, enlarging the nasal fossæ, thinning or destroying the bones, and penetrating by new ways or natural openings into the sinuses which surround the nasal fossæ."

Under the microscope they appear as true fibromata, containing, however, like the mucoid variety, glands, venous sinuses, and numerous capillaries. Both the fibrous and the mucoid variety of polyps are not infrequently combined in the same growth.

The question has arisen in my mind whether these growths could not be looked upon as simple hypertrophies of the mucous membrane which have undergone mucoid degeneration or fibrous change, or both, as the case may be; for in this way the presence of glands, venous sinuses, and spaces lined with epithelium within their structure, can readily be explained, while, on the other hand, the presence of these foreign elements cannot so easily be accounted

[1] Ueber den Bau der Schleim-Polypen, Berlin, 1855.

for if we consider the polyps genuine neoplasms. Having once started in a localized hypertrophy of the mucous membrane, the mucoid or fibrous change rapidly assumes large proportions under the stimulus of continued irritation, pushing the mucous membrane before it; and in this way the often enormous pear-shaped masses are produced. I have frequently found a number of small mucoid polyps on the mucous membrane near the site of larger ones which I had previously removed, and which, if left undisturbed, would soon have filled the nasal cavity by their increase in size. This is a question, however, which cannot be determined by merely examining extracted polyps, but may possibly be settled by making sections through the mucous membrane at the point of origin of the tumors.

The third variety of polyps is a large sessile cyst filled with thin watery mucus and covered with epithelium. In the few cases which I have seen—too few to make extended examinations as to the nature of these growths—they sprang from the lower border of the inferior turbinated bone. I have not met with any mention of them in the literature to which I had access.

Symptoms.—The symptoms to which the presence of polyps gives rise, when situated in the anterior nasal cavities, are a stoppage of either one or both nostrils, so that the patient is obliged to breathe through his mouth. This stoppage of the nose is usually aggravated in damp weather on account of the swelling of the neoplasms due to the hygrometric condition of the atmosphere. Articulation is altered by the absence of those consonants whose

articulation requires that a current of air should pass through the nose, and the patient speaks as if he had a cold in his head. Bleeding of the nose is a frequent symptom, and originates either from the tumor itself or from the congested mucous membrane in its neighborhood.

Tumors in the nasal cavities give rise to all the symptoms of nasal catarrh, and their presence is usually not suspected until a rhinoscopic examination is made, or until they appear in the nostrils.

These neoplasms are usually mucous or fibrous polypi, but other forms of tumors, such as have been enumerated as occurring in the larynx, are found.

Treatment.—The treatment of nasal polypi consists in their removal, and it becomes a question, which of the different methods is to be used to accomplish this purpose.

Before the introduction of the rhinoscope and the modern methods of inspecting the anterior nasal cavities, the surgeon made use of what is termed a polypus forceps, slightly curved, with elongated, fenestrated blades, the inner surfaces of which are ribbed, to afford a better hold upon the polypus. These were introduced into the nostril, and coming in contact with anything that felt like a tumor or polypus, the blades were forcibly closed, the forceps twisted in the hand, and traction made until the growth came away, either in fragments or, more rarely, bodily. This was repeated until the cavity seemed clear of polypi, or until the patient could no longer endure the pain. This method even now is practised by many surgeons, but it is, to say the least, unsatisfactory. In the first place, the forceps,

not being guided by the eye, comes roughly in contact with the congested mucous membrane, injuring it and giving rise to hemorrhage; further, the pedicle of the tumor is but rarely removed, so that the polypus speedily grows again, or, if it comes away, a shred of the mucous membrane to which it adheres is also torn away, giving rise to a great deal of pain and considerable hemorrhage; and finally the irritation and injury of the mucous membrane gives rise to considerable and extensive inflammation, which sometimes assumes alarming proportions.

Another method for the removal of nasal polypi, has been recommended by some authors, which consists in injecting into their substance, by means of a hypodermic syringe, some solution or liquid, with a view to cause a mortification of the tissues of which the tumor is composed, such as glacial acetic acid, tincture of iodine, alcohol, etc. It will be found, however, that as a rule these injections give rise to so much pain, that the patient is not willing to have them repeated on the other polypi; and if the solution is made so weak as not to give rise to much pain, the polypus is not affected by it.

The method which is preferable to any other, consists in removing the polypi with a wire snare in the following manner. The nostril being dilated with a dilator, and the cavity brightly illuminated, the Jarvis' snare is introduced, and the loop manipulated so that the polypus in view is encircled by it, and slips through it. The wire should be of a medium size, and the loop just large enough to take in the growth. The loop is then drawn in with the sliding tube, thereby causing it to slip around the

pedicle, and when tight around it the tumor is snared off by turning the milled nut. In a few seconds the polypus will come out held at the end of the canula, and cut off close to the mucous membrane, without the latter being in the least torn or injured, and consequently very little pain is experienced by the patient, and little, if any, hemorrhage follows the operation. One after the other of the polypi is removed in the same manner until the cavity is clear, which takes some little time, as they are generally multiple and quite numerous. Having accomplished this, every bleeding point which was the seat of a polypus, should be carefully touched with a flat galvano-cautery knife at a cherry-red heat, in order to prevent a recurrence of the tumors.

Sometimes the growths are attached high up between the turbinated bones, so that it becomes impossible to throw the wire loop around the pedicle and remove them in this way. In such cases forceps must be used, and it will be found that my universal laryngeal forceps answers the purpose better than the ordinary polypus forceps, because it can be shaped into the required curve, and its blade can be opened in a much narrower space, thus grasping the polypus at or near the pedicle. When, in the case of fibrous polypi, the neoplasm has penetrated into the antrum, by absorbing the bony partition between the two cavities by pressure, it can, in most cases, be removed through the nasal cavity; but if it has its attachment in the antrum, and has forced its way into the nasal cavity, then the former must be opened in order to remove the growth.

If polypi or other tumors are attached to the

walls of the pharyngeal cavity, or, as is sometimes the case, to the posterior edge of the vomer, they should also be removed with the wire snare in the same manner as was described for the removal of posterior hypertrophies.

The opening of the sac and emptying it of its contents, in the cystoid variety of polypus, affords relief from the symptoms of stenosis, but the cyst soon fills again, and therefore a more radical removal is necessary. To accomplish this, the cyst is opened in its entire length with a pair of scissors, and the flaps of tissue removed also with the scissors. The cut surfaces, as well as the remaining surface of the cyst, are then scorched with the galvano-cautery loop to prevent its re-formation.

Galvano-puncture.

There is another method of treatment for the removal of tumors, both in the larynx and in the nasal cavities, which frequently promises success where the other methods already described cannot be employed, viz., galvano-puncture.

In this mode of operation the powerful chemical action of electricity is made use of in order to break up the tissues of the tumor, and prepare them for speedy absorption. The procedure is a very simple one, and consists in the introduction of a needle into the substance of the neoplasm, to which is attached one of the poles of a battery, while the other pole is in contact with the skin in the neighborhood of the seat of the tumor. The battery need not be very strong, and for small tumors a single

pint Bunsen cell is sufficient. The needle should be msde of gold or silver, as steel is oxidized more readily by the electricity. From two to ten sittings are necessary to cause the absorption of a tumor the size of a pea in the larynx, while nasal polypi, especially of the mucous type, are often absorbed very much more quickly.

CHAPTER XVI.

TABLES OF SYMPTOMS OF THE DISEASES OF THE LARYNX AND NASO-PHARYNX.

THE following tables of symptoms of the diseases of the larynx and naso-pharynx have been compiled from the carefully kept records of over five thousand cases, treated both at the German Throat Infirmary and at the dispensary for throat diseases of the University Hospital.

It will be observed that secondary and tertiary syphilitic throat diseases, which by many authors are separated, have been classed under one common head, because the symptoms are very similar in both forms.

It will be further noticed that only those diseases which are strictly affections of the throat have been included, while those which are to be regarded as symptoms of general systemic disorders have been omitted.

Table of Symptoms of Diseases of the Larynx.

Symptoms.	Acute laryngitis.	Chronic laryngitis.	Tubercular laryngitis.	Syphilitic laryngitis.	Benign growths.	Malignant growths.	Functional diseases.
SUBJECTIVE.							
Voice	Hoarse, sometimes aphonic.	Hoarse; faltering; easily fatigued.	Hoarseness of peculiar character; aphonic in later stages.	Hoarse; seldom aphonic.	Variable, from slight hoarseness to aphonia.	Variable.	Aphonic in bilateral paralysis. Hoarse in other forms of paralysis.
Respiration	Not embarrassed except when œdema is present, then dyspnœa.	Not embarrassed.	Hurried; embarrassed in later stages.	Not usually embarrassed.	Embarrassment depends upon situation of growth.	Quickened and paroxysmal.	Embarrassed in paralysis of abductor.
Cough	Dry and hard; later moist.	Hacking, with starchy expectoration.	Painful; amount and character depending upon the lung implication.	Slight hacking.	Not severe; occasional expectoration of parts of growth.	Not severe: occasional expectoration of parts of growth.	Paroxysmal in spasmodic affections.
Deglutition	Usually painful.	Not interfered with.	Difficult and painful.	Unimpaired, unless epiglottis or arytenoids are ulcerated.	Impaired when growth is situated on epiglottis or ary-epiglottic fold.	Difficult and painful.	Not generally affected.
Pain	Feeling of constriction and acute pain.	Feeling of fulness.	Only in deglutition and phonation.	Absent.	Absent.	Severe.	Not usually present.

PHYSICAL.							
Color	Uniformly intense red.	Partially increased.	Grayish-red.	Dark-red in symmetrical patches	Variable with nature of the growth.	Livid.	Normal.
Form and texture	Swelling in œdema.	Abrasions.	Swelling of mucous membrane, ulcers, and pyriform swelling of arytenoid cartilages.	Ulcerations and specific neoplasms.	Variable; no ulcers.	Depends upon size and nature of the growth; large ulcers.	Form of glottis changed.
Position	Unaltered.	Unaltered.	Usually no displacement.	Unaltered except when changed by cicatrices of ulcers.	Normal parts seldom changed.	Displacement by infiltration.	No displacement.
External	Pharynx implicated.	Pharynx implicated.	Pharynx involved; physical signs of lung disease.	Pharynx, velum, and skin implicated.	None.	Glands implicated; cancerous cachexia.	Other organs may be affected.
CAUSE	Exposure to draught. Embedded foreign bodies or corrosive substances.	Impure air; abuse of voice.	Same as of lung affection.	Primary sore.	Uncertain.	Primary cancer in other parts.	Cerebral disease, hysteria, acute and chronic laryngitis.
PROGNOSIS	Favorable except in œdema.	Favorable.	Unfavorable.	Favorable.	Depends upon size and position of growth.	Unfavorable.	Favorable when cerebral disease is absent.

Table of Symptoms of Diseases of the Naso-Pharynx.

Symptoms.	Acute pharyngitis	Chronic pharyngitis.	Syphilitic pharyngitis.	Granular pharyngitis.	Tonsillitis.	Nasal polypi.	Nasal catarrh.
SUBJECTIVE. Voice	Usually hoarse, with thick articulation.	Normal, unless larynx is implicated, then hoarse and easily fatigued.	Normal, or slightly hoarse. Articulation nasal if velum or uvula is ulcerated.	Usually hoarse from laryngeal implication. Articulation normal.	Normal; articulation thick.	Normal; articulation nasal.	Normal; articulation more or less nasal.
Respiration	Not interfered with except when tonsils are touching each other.	Not interfered with.	Not affected.	Not affected.	Affected only in severe cases.	Respiration through nose more or less obstructed.	Respiration through nose affected, especially in recumbent position.
Cough	Hacking; later moist.	Dry, but slight, white stringy expectoration.	Variable.	Often severe and dry, with little expectoration.	Slight.	Absent.	Slight, with expectoration of thick tenacious mucus.
Deglutition	Difficult and painful if tonsils and glands are implicated.	Not affected.	Difficult according to position of ulcers.	Not affected.	Almost impossible, and very painful.	Not affected.	Not affected.
Pain	Severe lancinating.	Sense of dryness and burning.	Usually absent.	Sense of dryness and fulness.	Severe.	Usually absent.	Frontal headache, sense of dryness in nose and pharynx.
PHYSICAL. Color	General redness of mucous membrane.	Generally diminished, with prominent veins.	Brick-red. Symmetrical patches.	Usually paler than normal.	Tonsils appear livid.	General hyperæmia of nasal mucous membrane.	Redder than normal.

Form and texture.	Not changed.	Mucous membrane dry and shining.	More or less deep ulcers on pharynx, velum, and tonsils.	Red nodules and prominent veins on surface of pharynx resembling granulation.	Great tumefaction of the glands.	Depends upon character of polypus.	Tumefaction of mucous membrane. Hypertrophies. Shallow ulcers.
External	Larynx implicated.	None.	Skin implicated.	None.	Implication of cervical and submaxillary glands.	Stoppage of nose; dryness of mouth and pharynx; bleeding from nose.	Stoppage of nose, often watery discharge; slight depression and widening of bridge of nose.
CAUSE	Exposure to cold.	Bad air, alcoholism, masturbation.	Primary sore.	Abuse of voice; gastric derangement.	Exposure to cold.	Uncertain.	Vitiated air and changeable climate.
PROGNOSIS	Favorable.	Favorable.	Favorable.	Favorable.	Favorable in most cases.	Favorable.	Favorable.

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